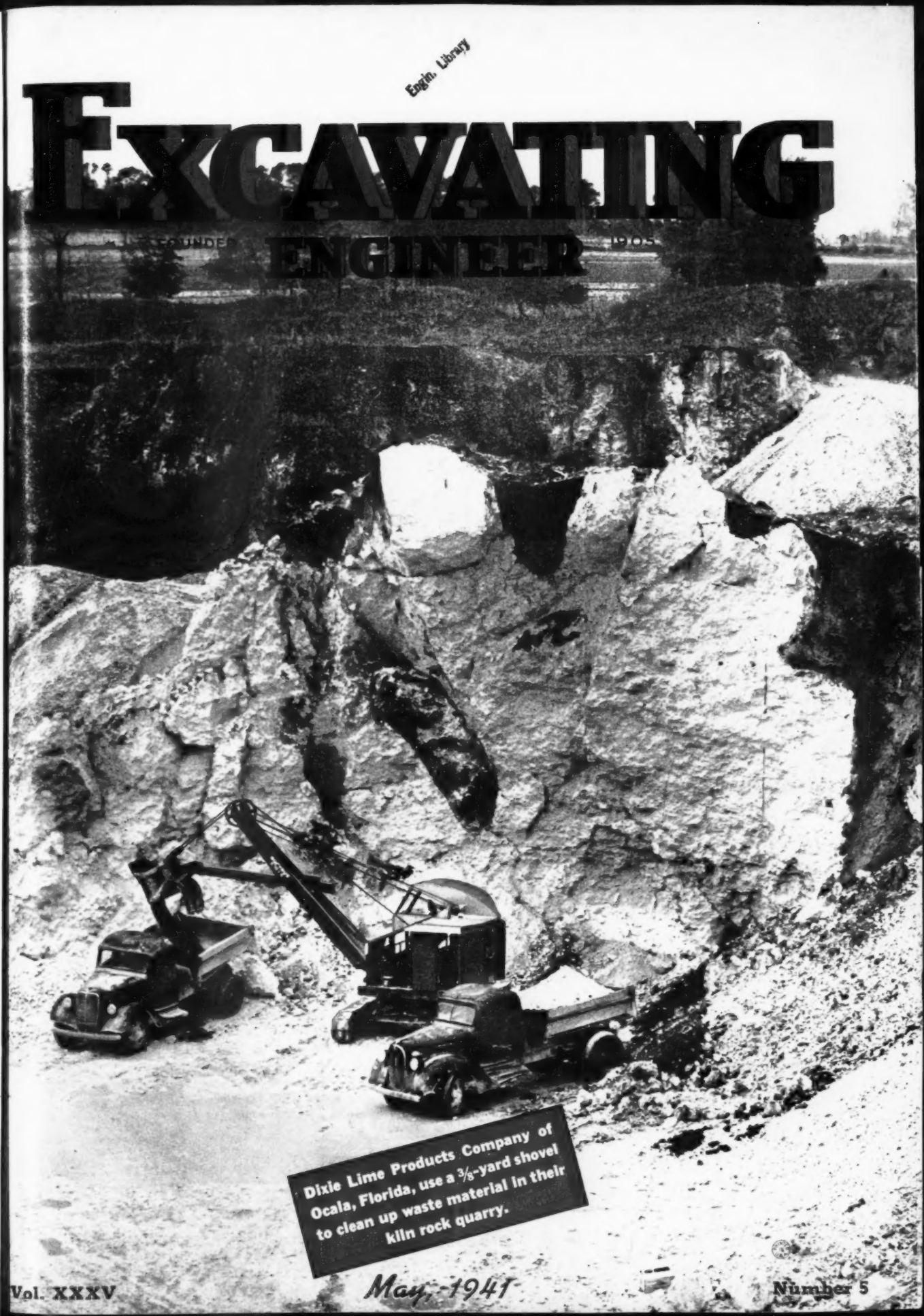
Engin. Library

EXCAVATING ENGINEER

FOUNDED 1905



Dixie Lime Products Company of Ocala, Florida, use a 3/8-yard shovel to clean up waste material in their kiln rock quarry.

Vol. XXXV May, 1941 Number 5

Dig more $ from your pit

with

BUCYRUS ERIE

FIVE-YARD

120-B

1 ACCURATELY CONTROLLED POWER . . . Ample power under perfect control on each motion, hoist, swing and crowd, gives the 120-B a fast cycle. Torques, speeds and weight placement are scientifically balanced for high-speed digging. Responsive control makes it easy to maintain speed for big output throughout the shift.

2 LOW OPERATING COSTS . . . Balanced design blends operating reactions smoothly, resulting in minimum stress on machine. Every part has an ample safety factor, but modern design avoids excess weight and keeps power consumption at a minimum. With the 120-B you have minimum upkeep and minimum lost time because of time-tested design and Bucyrus-Erie quality construction.

3 EFFICIENT DIGGING ACTION . . . Long effective upper boom section, big sheaves and single-part hoist give a wide angle between line of bail pull and line of backward thrust that means maximum effective digging force at the dipper teeth. Power is applied efficiently to the business of digging throughout the 120-B.

4 BIG OPERATING RANGE . . . The 120-B has long range and high lift that make it possible to handle wide cuts efficiently. This means minimum time spent shifting tracks or shovel, and means efficient loading into modern cars or trucks. Moves, digs, and loads on steep grades; easy to get in and out of cuts.

5 FAST FULL SWING . . . Twin vertical swing units, properly balanced, give smooth action, with quick acceleration and deceleration. Full revolving, the 120-B sets oversize rocks aside easily, loads out slides quickly. With ability to load on either side, it is easy to save time by double spotting on truck haul.

6 COMPLETE MOBILITY . . . The 120-B mounting is rugged and flexible. It is a firm foundation for digging and provides for quick move-ups and fast moves from slides. The 120-B can climb stiff grades, dig in or out of a cut in either direction, go anywhere in the pit in a hurry. Ideal for mixing rock or ore; saves by doubling on loading and stripping operations.

7 EASY CONVERTIBILITY . . . The 120-B can be easily and quickly converted from shovel to dragline, or vice versa, in the field. This increases its potential usefulness, as well as giving it a higher resale value.

Bucyrus-Erie Compan

SOUTH MILWAUKEE • WISCONSIN • U. S.

THIS DOCUMENT IS THE PROPERTY OF THE NEW JERSEY STATE

EXCAVATING ENGINEER

FOUNDED 1905

contents

Vol. XXXV **May, 1941** No. 5

May Advertisers

Allis-Chalmers Manufacturing Company 289
American Chain & Cable Company .....3rd Cover
American Steel and Wire Company .....4th Cover
Atlas Imperial Diesel Engine Company 266
Bethlehem Steel Company 265
Brooks Equipment and Manufacturing Company 305
Buckeye Traction Ditcher Co. 263
Bucyrus-Erie Company...2nd Cover, 264, 295, 307, 308-309, 311, 320
Bucyrus-Monighan Company .. 287
Caterpillar Tractor Company... 285
Columbia Steel Company..4th Cover
Ensign-Bickford Company, The 262
For Sale (Classified) 318-319
Gatke Corporation 306
Haiss Manufacturing Company, George 301
Hayward Company, The 307
Hercules Powder Company 297
Hercules Steel Products Corporation 303
Ingersoll-Rand Company 257
International Harvester Co. ... 315
Jones & Laughlin Steel Corporation 307
Koehring Company 267
Leschen & Sons Rope Co., A. .. 316
Macwhyte Company 299
Northwest Engineering Company 293
Onan & Sons, D. W. 302
Owen Bucket Company 317
Positions Wanted (Classified). 317
Roebling's Sons Co., John A... 258
Rogers Brothers Corporation .. 310
Sauerman Brothers 305
Socony-Vacuum Oil Company, Inc. 260-261
Standard Oil Company of California 283
Templeton, Kenly & Co. 304
United States Steel Corporation Subsidiaries .....4th Cover
Wellman Engineering Co., The 303

Front Cover

Waste material in the Dixie Lime Products Company kiln rock quarry near Ocala, Florida is loaded out to double-spotted Ford trucks by a Bucyrus-Erie 10-B shovel. After the waste is removed, a blast will be made and the large chunks of kiln rock will be sorted and loaded to the trucks by hand.

TVA Construction Plant Methods — By Philip H. Kline .. 269

Job planning and equipment coordination are increasing in importance as America's dirt moving contractors steadily expand their operations. This article, the first of a series of two on TVA plant procedure, may give you some ideas that can be adapted to your own organization.

Bulldozer Built Basements 272

A. Elsinga, of Chicago, uses three bulldozers, three trailers and a ⅜-yard shovel in his year 'round basement excavation business

Florida Farm Hands 274

Two ⅜-yard draglines converted to ½-yard irrigation ditch excavators play an important part in preparing and maintaining the vegetable farms of Fritz C. Stein and his neighbors at Belle Glade, Florida.

Maintaining San Bernardino's Highways — By Floyd Suter Bixby 276

The largest county in the United States, San Bernardino keeps a 3,477-mile highway system shipshape by efficiently coordinating the operations of its men and equipment.

Editorials 280

"For the Want of a Nail" 280
Hats Off to the Quartermasters! 281
Highway Intersections, Emergency Airports? 281

Equipment You Ought to Know About 282

Motor grader 282
Diesel engine 282
Tractor-trailer 282
Carrimore scraper 282
Diesel tractor 284
Cement-handling hose 284
Aridifier air cleaner 284
Unitilt bulldozer 284
Lubrication barrel pumps .. 284
High-wattage lamp 286
Ace automatic lubricator.. 286
Amsco welding rod 286
Koehring trail dump 286
Heavy duty jack 286
Flexible coupling 286

Shots from the Firing Line 300

Construction Volume Largest Since '29 300
We've Just Begun! 300
Ft. Bragg Construction Operations 300
Prado Dam Goes to Work .. 302
Contract Let to Clear Shasta Reservoir Site 302
California Soil-Cement Highway 304
Mittry Brothers Win Gila Project Bid 304
Montana Opens Airport Bids 305
New York Safety Convention 305
Grand Coulee Highway Relocation Bid 306
Commissioner States U. S. Power and Irrigation Plans 307

Obituaries 310

Charles B. Owen
Gavin William Hamilton

Not in the Contract 314

Notes from the Manufacturers 316

New Trade Literature 317

Published Monthly by THE EXCAVATING ENGINEER PUBLISHING COMPANY, South Milwaukee, Wisconsin, U.S.A.

F. O. WYSE, *Manager* — ARNOLD ANDREWS, *Assistant Manager*
D. B. REED, JR., *Editor* — M. J. BARGENQUEST, *Associate Editor*
JOHN L. MORAVEC, *Art Director* — DELMAR COHEN, *Assistant Editor*
E. M. HEUSTON, *Sales Manager* — E. E. BRIESEMEISTER, *Assistant Editor*

CCA Member Controlled Circulation Audit

Regular subscription: 25 cents per copy, $2.50 a year; Canada, subject to publication policy, $3.50 per year. Special subscription: Upon application on card inserted in this number this publication will be sent frequently (not regularly) free of charge, to companies, executives and supervisors engaged actively in the industry of excavation.

COPYRIGHT 1941 BY THE EXCAVATING ENGINEER PUBLISHING COMPANY

Air Drills Pull

WITH GARGOYLE VOCO

TO KEEP AIR DRILLS punching hard, you need correct lubrication. Your oil must do all these jobs:

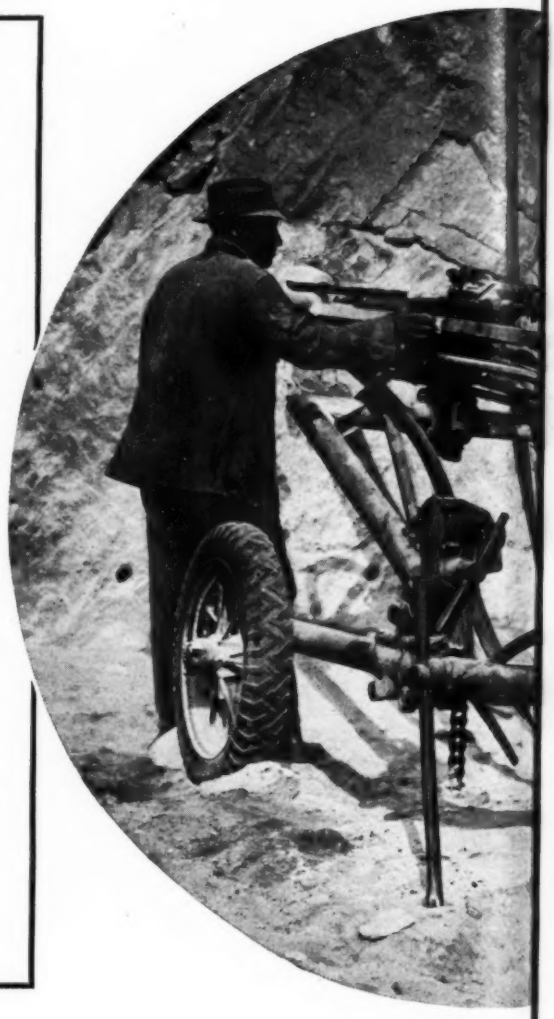
☛ It must stick tight . . . even under constant washing by moisture entering with the air.

☛ It must minimize cylinder wear with a tough lubricating film.

☛ It must seal the piston against power-wasting "blow-by" to help keep air costs down.

☛ It must function under low temperatures, prevent valve sticking, and maintain full drill speed.

Gargoyle Voco Engine Oil No. 1 is the oil that meets all these "musts." This famous oil helps keep your air drills hammering home profits.

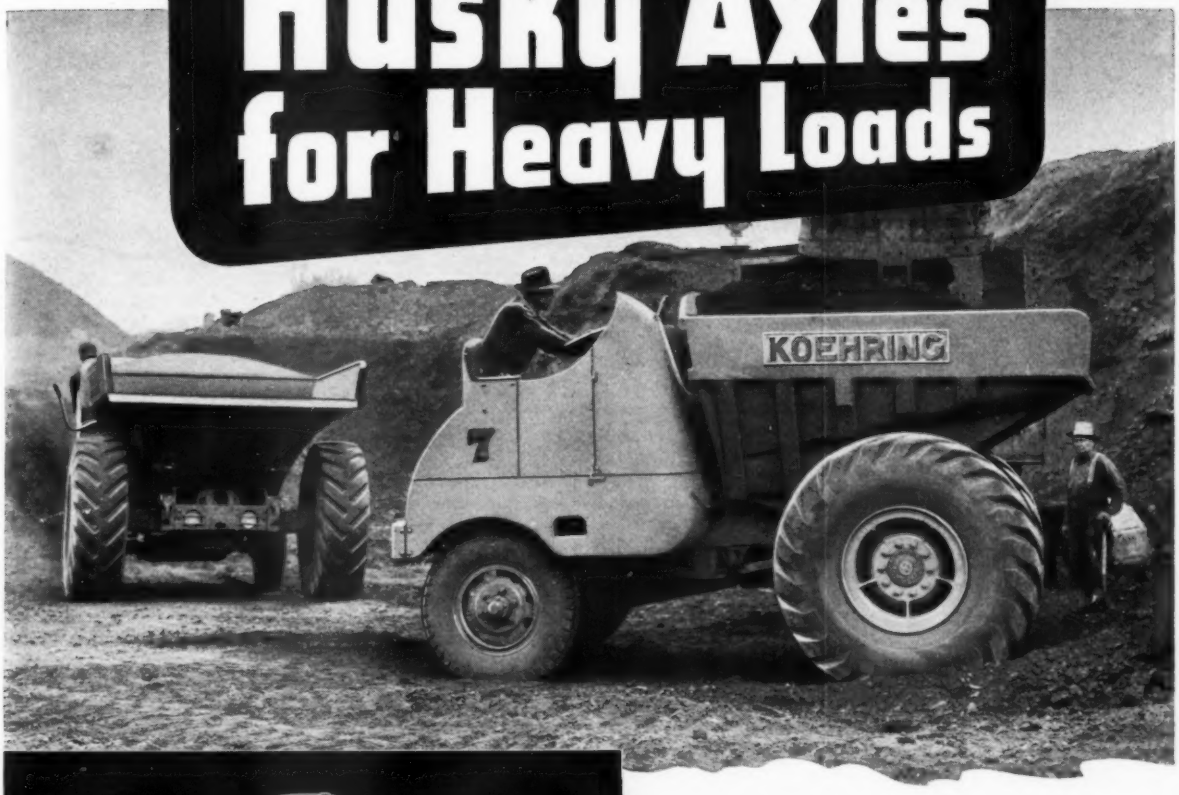


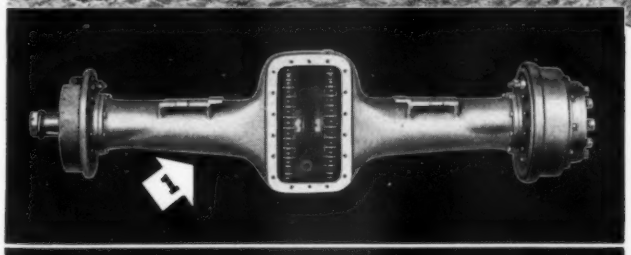
CALL IN Socony-Vacuum fo

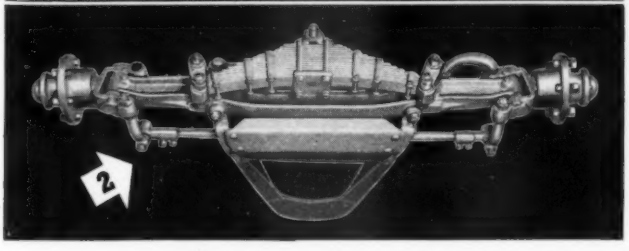
YOU'LL BENEFIT FROM: 75 YEARS' LUBRICATION EXPERIENCE
PRODUCTS APPROVED BY ENGINE BUILDERS

For your convenience in writing to Socony-Vacuum Oil Co., you will find a card bound in this issue.

Husky Axles for Heavy Loads







1 Alloy steel drive axles housed in one piece alloy steel casting. Anti-friction bearings, splined shafting, alloy steel sprockets and chain.

2 Free oscillating, spring mounted, steering axle eliminates frame bending strains, when traveling over uneven grades.

KOEHRING DUMPTORS SCORE AGAIN

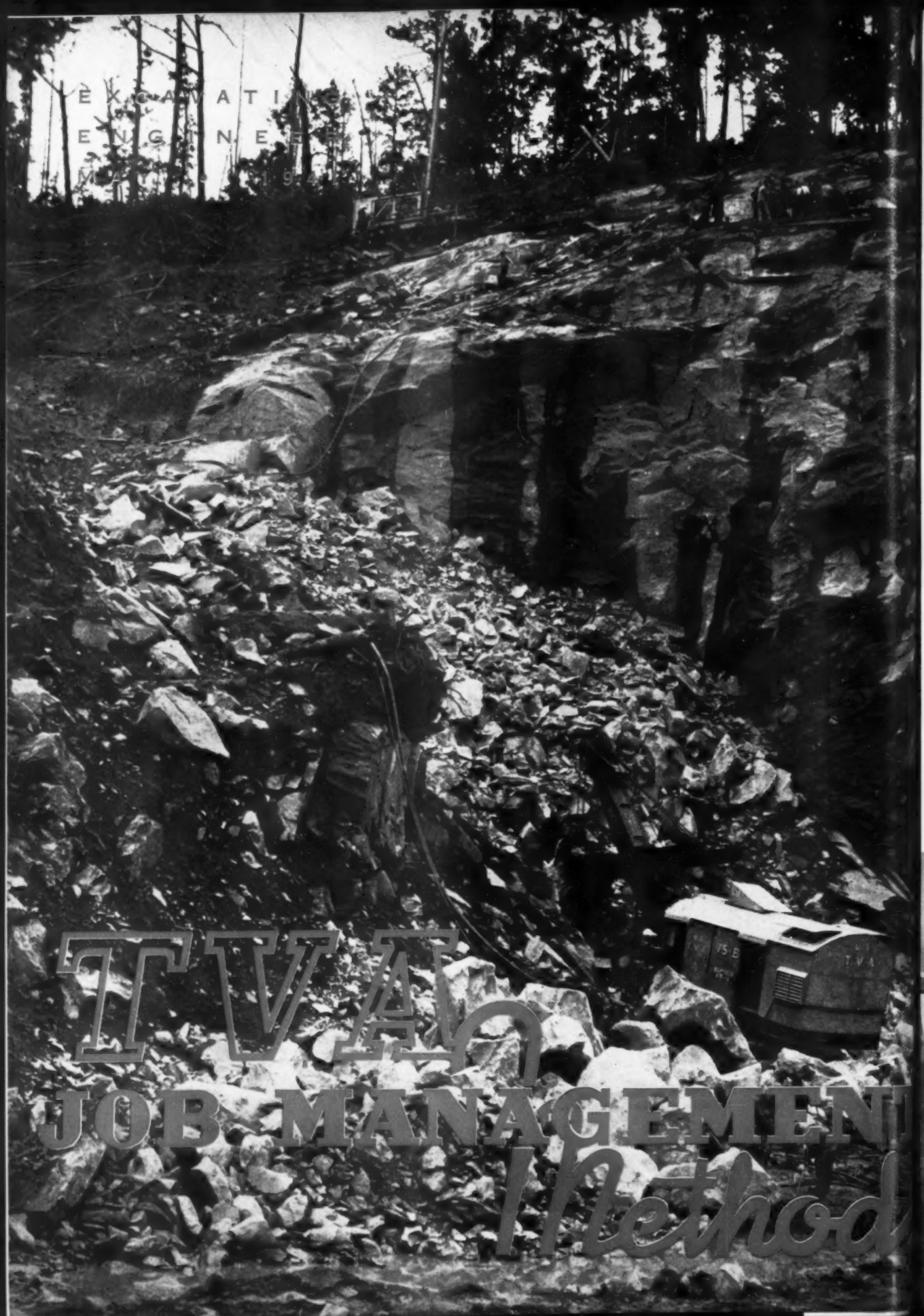
Another Koehring Dumptor success story . . . Open pit mine operators have recognized and accepted the flexibility and economy of Dumptors for hauling iron ore and stripping. Heavy loads of iron ore, approximately 4000 pounds per cubic yard, are easily carried by the husky Dumptor axles . . . designed and built for heavy loads. Satisfactory service with surprisingly low upkeep cost, under mine operation conditions, means long-lasting service on dirt and rock hauling jobs. Why don't you use Koehring Dumptors on *your* job? The investment is low, upkeep cost is low, more yards per hour are moved, your cost per yard is reduced. You can move *more* dirt or rock at lower costs, with Koehring Dumptors.

KOEHRING CO., *Milwaukee, Wis.*

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

For your convenience in writing to Koehring Co., you will find a card bound in this issue.


EXCAVATING
ENGINEERING
MAY 1941
TVA
JOB MANAGEMENT
Method

Job planning and equipment coordination are increasing in importance as America's dirt moving contractors steadily expand their operations. This article, the first of a series of two on TVA plant procedure, may give you some ideas that can be adopted to your own organization

By PHILIP H. KLINE

THE EXCAVATION and construction problems of today have become so closely linked with mechanical equipment that the management and operation of such equipment is a major feature in itself for every active organization in this field. The Tennessee Valley Authority with construction plant running into several million dollars has major problems in this respect, yet practically all of them were solved by methods that may be applicable to anyone engaged in large or small equipment use.

The planning and selection of equipment, its purchase and installation, and then the careful administration during its life are handled in the TVA through a central organization cooperating with the individual jobs which are each responsible for the costs and procedures on their particular operations.

While this article deals chiefly with arrangements after the equipment is received and treats in detail problems of plant records, scheduling of equipment, performance, maintenance and inspection, storage and disposal—the related activities of planning and selection of equipment are touched upon briefly to show the continuous application of operating data and the necessity for a completely rounded out program and organization.

Many plant operating problems have a practical turn long before the equipment reaches the field and starts to work in earnest. The designer, estimator, superintendent, and master mechanic bring up pertinent questions that are answered from previous operation experiences. What equipment is now owned? Where is it? Of what does it consist? When will it be free? What are its operating costs; its first cost; its probable life? What kind of work can it do? How has it performed, and how does it compare with other equipment facilities or means of doing work? It is obviously poor planning to save ten or twenty per cent on the purchase price of a machine and pay out an equal or greater amount in increased repairs. In addition, the production delays are apt to cause a more serious loss. Most of all, the field forces are not allowed to feel they have been "saddled" with equipment not to their satisfaction.

Planning and Scheduling

The adoption of major plans and selection of key units are carefully developed by experienced men from central and field organizations. The many special studies made and the details and sequence of these steps cannot be justifiably explained herein, but it is emphasized that these arrangements save many questions and delays during the installation of major equipment assemblies. A completed job schedule takes the

• Opposite Page: Preliminary quarry operations at TVA's Hiwassee Dam called for some heavy rock handling. Here a 3-yard electric Bucyrus-Erie shovel digs in for working room while workmen on the top ledge prepare a skidway for a Bucyrus-Erie 29-T blast hole drill.

• A fully assembled shovel is floated into a cofferdam area to a waiting crib above water level. Later the area was drained and the shovel crawled down a ramp ready for work.

usual form of a bar chart with the item lines numbered or bars cross-hatched to show recurring operations. This allows quick review of repetitive equipment use. In one case, a condensed hydrograph of previous river stages was plotted to show in which months dry and wet seasons were generally encountered.

The mobile equipment scheduling closely follows the job construction schedule. Equipment planned for is treated in groups according to an investment classification which parallels functional usage on all jobs. Thus it is possible to review like equipment needs and arrange transfers or trade-ins to the best economic advantage of the program as a whole. The probable number of machines needed in each class is then summarized by months. Where need be, portions of these individual job schedules are combined for all locations to make an interproject schedule for individual item study and assignment of existing or proposed machines.

From an interproject item schedule, the items best fitted for the jobs are reviewed as to size, performance, age, and overall minimums of new purchases. This chart shows all projects' requirements in quantities and months and the individual machines and their location. The future program is outlined in terms of units of equipment to meet the needs of all jobs. The size, type, power, and TVA number of each machine is shown so that all parties concerned are advised of the administrative decisions made by the approved drawing. Where heavy truck, tractor, or scraper requirements appear to peak at late spring or summer seasons, outside rentals are secured. These rentals clear through the central operations section so that they may be watched for proper rates, machine performance, and feasibility of return or transfer at the end of one job's use.

Adaptability of particular machines to the work in hand is watched carefully on these assignments. Equipment dimensions and weights are noted for shipping arrangements; car or barge loading, tunnel clearances, etc. On a foundation job the reach of the shovel boom, and the turning radius, or the speeds of hauling units on various grades to be encountered, have an important bearing on the equipment selected.

For example, at Hiwassee Dam the geology and composition of the quarry rock indicated the best opening approach was by sluicing the overburden and establishment of a face by the use of Chicago Pneumatic G100 wagon drills. One Keystone Model 84 and two Bucyrus-Erie Model 29-T blast hole drills operating on skids were selected for boring 6- or 9-inch blast holes. Two 75-B Bucyrus-Erie electrically operated 2½ cubic yard shovels with one interchangeable dragline attachment were provided for quarry and foundation rock handling and other job crawler crane service.

• This pipe frame template to guide steel piling on cellular cofferdam construction was designed by the TVA superintendent at Pickwick Landing Dam. The idea has been used on many later jobs.

A handy chart or simple slide rule is available from the maker of one carry type scraper. These aids show the cost and the maximum and average job delivery of round trip hauls over a variety of grades and material. Another tractor company furnishes a complete booklet giving estimates of depreciation - repair (ownership) costs, operating expense, and probable speeds under the six selective gears. On one hauling arrangement, a cycle study showed that the original request for four trucks was in excess of loading and unloading facilities by more than one truck, and that by staggering the operators' checking-in time over half hour intervals, considerable lost time was eliminated at the beginning and end of shifts. At times it may be possible to show that for fluctuating compressed air requirements a combination of small machines may be cheaper than the installation of one large stationary compressor. This may be due to the increased expense of producing a small amount of air with a large machine and the possibility of further savings by removal of one of the smaller machines to a new job.

Requisitioning and Specifications

Requisitions for equipment are on standard forms showing delivery point, shipping instructions, and manner of specifications. Of particular interest in this respect is data of the following character:

1. **Use.** To what service will the equipment be placed on the requisitioning job, and what other projected use is considered as justification for the purchase? What are the peculiar conditions of type of service?
2. **Length of Service.** How long in months are requirements anticipated for the item, and will there be idle periods of over a month during which the equipment may be available for other jobs? (Note: Major repairs will be made on normal out-of-service hours.)
3. **Availability Substitutes.** Has the requisitioner checked his job for available equipment and substitute methods, or will this purchase release other equipment not well adapted to the particular service requirements?
4. **Complementary Equipment.** Be sure to state attachments, connections, power characteristics, limiting features of capacity, dimension, weight or draft,

TABLE I CONSTRUCTION EQUIPMENT PARTS CLASSIFICATION ANALYSIS

Twenty-item Breakdown of Mechanical Features for Specification Writing, Field Record and Performance Summary

	TRUCKS	TRACTORS	SHOVELS
1	Lubrication and Maintenance	Lubrication and Maintenance	Lubrication and Maintenance
2	Tires	Tracks	Crawler
3	Frame	Frame	Dipper
4	Wheels	Truck and Support Rollers	Dipper Handle
5	Brakes	Truck and Support Idlers	Boom
6	Springs	Equalizer and Links	Crowd
7	Front Axle	Front Idler	Swing
8	Rear Axle	Final Drive	Hoist
9	Steering	Final and Steering Clutch	Yoke and Shipper Shaft
10	Electrical	Electrical	Electrical
11	Body and Hoist	Bulldozer and Hoist	Cab, Mounting and Accessories
12	Main Transmission	Main Transmission	Center Journal
13	Aux. Tran. Drive Shaft, Univ.	Aux. Tran. Drive Shaft, Univ.	Cables
14	Clutch	Master Clutch	Clutch and Controls
15	Fuel	Fuel	Fuel
16	Cooling, Oil and Water	Cooling, Oil and Water	Cooling, Oil and Water
17	Bearings and Connecting Rods	Bearings and Connecting Rods	Bearings and Connecting Rods
18	Valves and Valve Timing	Valves and Valve Timing	Valves and Valve Timing
19	General Overhaul	General Overhaul	General Overhaul
20	Accidental	Accidental	Accidental

	LOCOMOTIVES	TRUCK CRANES	BOATS
1	Lubrication and Maintenance	Lubrication and Maintenance	Lubrication and Maintenance
2	Tires	Tires	Decks and Rigging
3	Frame	Frame	Hull
4	Wheels	Wheels	Framing
5	Brakes	Brakes	Reversing Devices
6	Springs	Springs	Cabins and Superstructure
7		Front Axle	Quarters, Galley and Mess
8		Rear Axle	Hoisting or Handling Accessories
9			Steering
10	Electrical (Ignition only)	Electrical	Electrical (Ignition only)
11	Electrical Drive and Controllers	Boom and Cables	Electrical Gen. and Control Panel
12		Transmission	Driving Mechanism
13		Operators (Labor only)	Governor
14		Clutches	Propeller
15	Fuel System	Fuel System	Fuel System
16	Cooling, Oil and Water	Cooling, Oil and Water	Cooling, Oil and Water
17	Bearings	Bearings	Bearings
18	Valves and Valve Timing	Valves and Valve Timing	Valves and Valve Timing
19	General Overhaul	General Overhaul	General Overhaul
20	Accidental	Accidental	Accidental

items needed to serve the equipment (trucks for shovels, tractors for graders), etc.

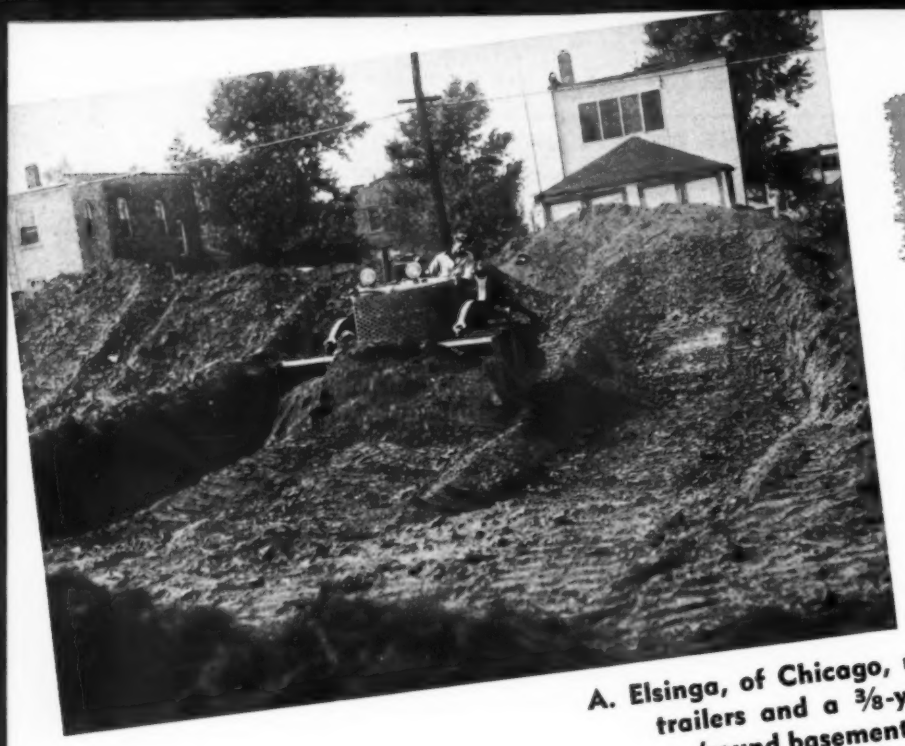
5. **Preference Data.** If recommendations are made as to job preference, state reasons in terms such as spare parts stock and other makes carried, size and power limitations, performance experiences as against competitive makes, mechanical advantages or deficiencies, safety, mobility, accessibility, speed, test run, delivery, economy, etc.

The nature of the requisition indicates the manner of handling. Emergency requests are generally due to some unexpected release of natural forces—flood, fire, wind, lightning, etc. Available standard equipment is usually supplied in these cases. Rush acquisitions sometimes occur due to a rapid change of the scope of the job. Generally the type, size, and general conditions of the equipment are known, which allows a quick survey of the market and selection of a very few sources from which to choose. Standard requests may run from a blanket order for many items "in a hurry" to a normal request for an individual machine for an already organized job or program. Again, standard items are generally selected in such cases, often allowing interchangeability with existing equipment and curtailment of spare parts stocks. Special requirements include temporary rentals where standard and available items are most commonly sought for, new devices or combinations which necessitate the assignment of a development engineer; and replacement of existing machines by ones of the same make and type that fit into a job or combination of equipment. An example of this is a complete wagon drill outfit which might be considered composed of three separate units — drill, mounting, and hoist. At times a single unit is selected to fit such a group. Care is taken not to continue use of obsolete models by the all-too-easy form of request, "emergency replacement."

The specification requirements are tied into operation experiences by field observations and records that show up mechanical advantages and deficiencies. A recent analysis of the repair expense of two concrete mixers gave a good basis for selection of new units for future jobs. As a guide for analysis of mechanical performance, a twenty-part classification of major assemblies or machine parts can be selected for review and development. Table I (above) shows such a setup for six types of equipment.

Actual specifications are developed by mechanical and electrical specialists thoroughly acquainted with manufacturing and engineering principles. Space does not

(Continued on page 288)



• Excavation is well underway, as this Chicago basement is neatly carved out by a Bucyrus-Erie bulldozer mounted on an International TD-14.

Bulldozer Built Basements

A. Elsinga, of Chicago, uses three bulldozers, three trailers and a 3/8-yard shovel in his year 'round basement excavation business

CONTRACTOR Al Elsinga does a wholesale basement business in suburban areas around Chicago. Specializing in this work for the last four or five years, he has developed an equipment "fleet" and a method that cuts the time required to a minimum.

According to the Elsinga method, where it is not necessary to remove excavated dirt from the site, the work is handled by bulldozer. Mr. Elsinga has three Bucyrus-Erie blades, two mounted on 40 h.p. International Trac-TracTors and one on a 54 h.p. International TD-14. The actual bulldozer excavation method used is described on the opposite page. Other contractors use bulldozers for basement work around Chicago, but Mr. Elsinga is the only one to use rigs as large as these. Each dozer has its own pneumatic-tired platform trailer, to provide the ready mobility that is an important part of the work, as each rig has several moves to make every day, and idle time has no place in the Elsinga set-up.

A 3/8-yard Bucyrus-Erie 10-B shovel is used to excavate basements where dirt must be hauled from the site, and for loading borrow material when the contract calls for fill. The 10-B uses the same trailer as the TD-14 bulldozer, and consequently, these two rigs are never used at the same time.

Winter and Summer Operations

Basement digging goes on winter and summer. In cold weather, the frozen surface ground is "ripped" with a corner of the bulldozer blade, and once that is loosened there is no difficulty in proceeding in the regular way.

The operator of each bulldozer unit is responsible for the maintenance of his rig. Each has a helper who drives the trucks hauling the trailers, helps with lining up grades, does what hand finishing is necessary, and acts as a general assistant. A total of seven men comprise the working organization. Mr. Elsinga lines up the business, plans the job order for each day and maintains general supervision over the progress of all the jobs.

Several building contractors have an arrangement by which

(Continued on page 312)

• Contractor Elsinga's 'dozer pushes dirt out of an excavation to a pile that later will be used for backfill around the completed foundation.

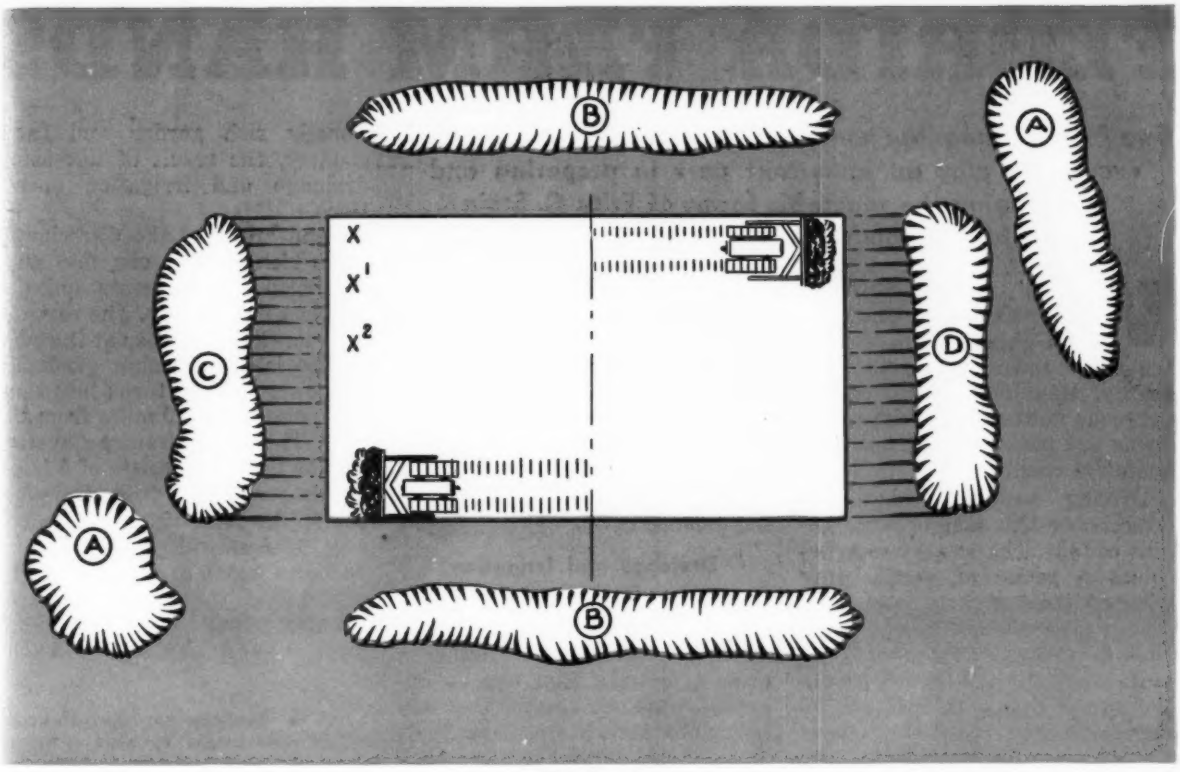


FIG. 1

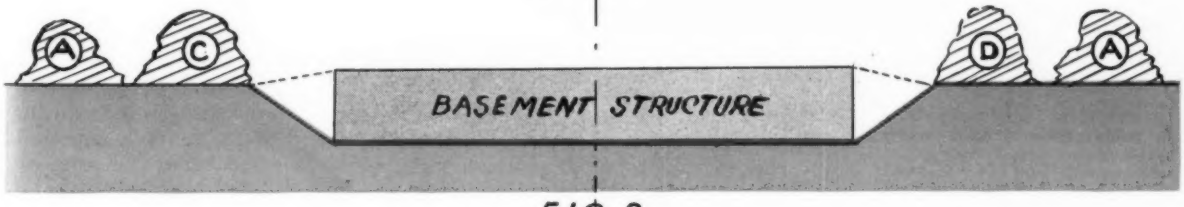


FIG. 2

The first operation on an Elsinga "Bulldozer-Built Basement" is removing the topsoil. This is bladed, as shown in Fig. 1, into two piles (A) at the front and back of the lot. Next, a series of shallow cross cuts build up piles (B) with just enough dirt to backfill along the sides of the finished basement structure. Then, starting at points X, X^1 and X^2 a series of shallow arc cuts are taken, the dirt being pushed to pile (D). This is continued until the maximum depth of excavation is reached at the center line.

Next, working from the center line, the bulldozer completes excavation of one-half the basement, pushing the dirt to the end line, then up a slope to pile (D). Subsequently, working from the center line, but in the opposite direction, the remaining half is completed to grade, the dirt being pushed to pile (C). The excavation then has the cross section outlined in red in Fig. 2. This part of the operation usually takes from 1½ to 2 hours, depending on the size of the basement.

While the general contractor is pouring the concrete basement structure, the bulldozer is moved on its pneumatic-tired trailer to another job. When the concrete is set and painted with a waterproofing tar, the bulldozer is returned to the site. Piles B, C and D are back-filled around the structure, and the lot is rough graded. The time required by this back-filling and grading averages between 1 and 1½ hours.

If the contract calls for it, the Elsinga organization also spreads the top soil and handles final grading of the lot after the house has been erected. By using the back of the blade (as well as the front) the bulldozer operator can make front and back yards as smooth as the proverbial billiard table—all ready for the householder to put in seeds for lawn and garden.

FLORIDA FARM HANDS

Two 3/8-yard draglines converted to 1/2-yard irrigation ditch excavators play an important part in preparing and maintaining the vegetable farms of Fritz C. Stein and his neighbors at Belle Glade, Florida

WEST PALM BEACH, Florida, and its swanky neighbor, Palm Beach, are both towns of exceptional beauty. Magnificent royal palms, gorgeous flowers, and trim green lawns are pleasant evidence of a bountiful country.

Driving west towards Lake Okeechobee this magnificence begins to fade. The scenery soon becomes a series of small, gray wizened trees and an occasional orange grove. Nearing Lake Okeechobee, green furry Australian pines mark the presence of irrigation canals that have been dug by men who are reclaiming these wasted acres for agricultural use.

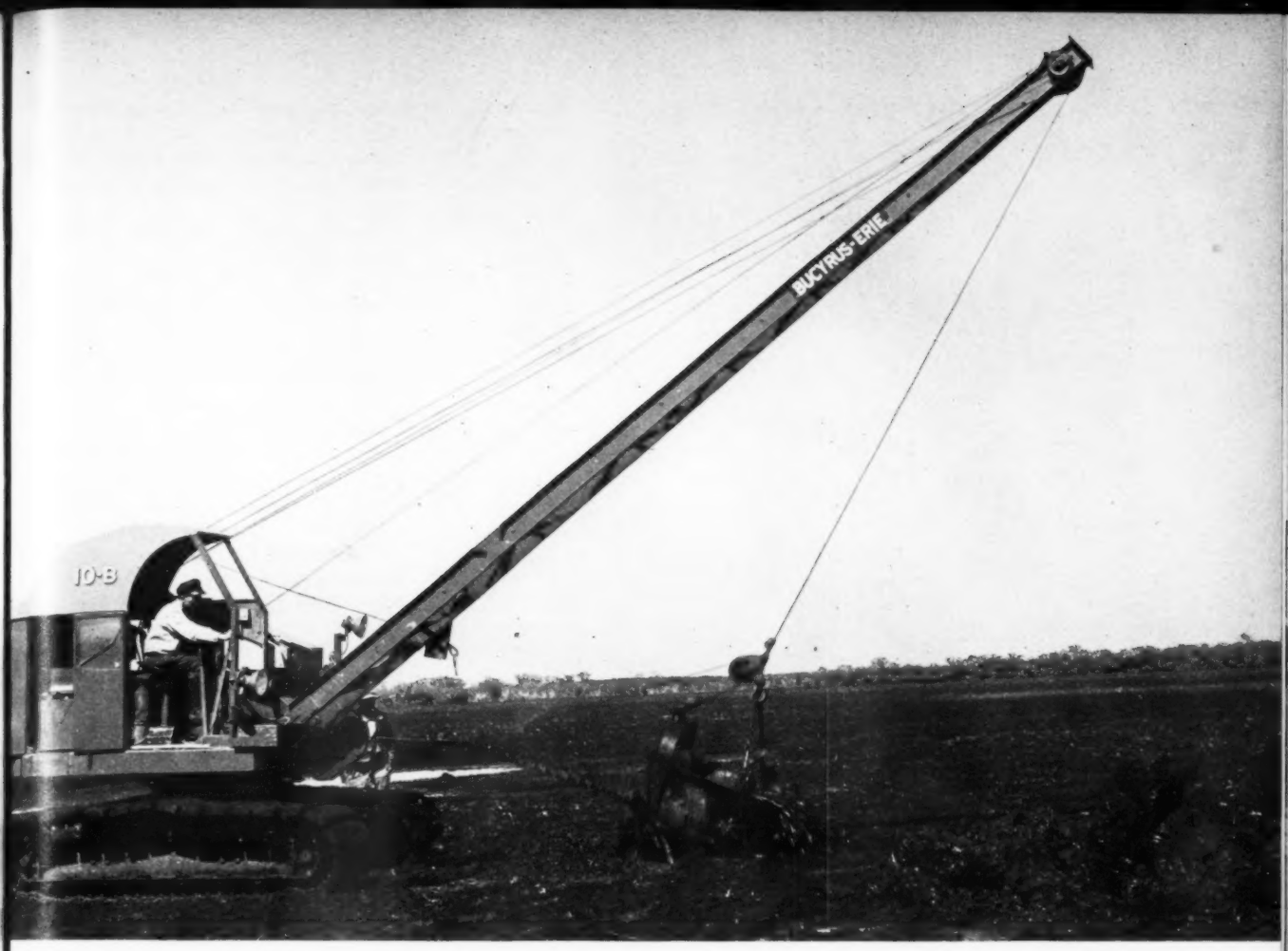
After miles of lonely road through desolate fields of waving saw grass, we begin to see the vegetable farms that are spreading a coat of green over Florida's former waste lands. Men toil in fields of rich dark earth on both sides of the road. Celery, beans, cabbage, lettuce, and sugar cane are some of the products that will be harvested from these promising looking fields.

Drainage and Irrigation Operations

The virgin Everglades of Florida are seemingly as useless a piece of ground that can be imagined, good for neither man nor beast. But here in the Belle Glade section, stretching for miles back from the south shore of Lake Okeechobee is a region of exceptionally rich garden and farm country, the result of unceasing drainage and irrigation operations.

Land around Lake Okeechobee is as rich as you can find anywhere, but it presents quite a problem in drainage. The earth is pure muck, 7 feet deep at the edge of the lake, becoming gradually shallower until it turns into sand at a point about 20 miles from the lake. The main drainage system for the district consists of 5 large canals stretching from Okeechobee to the Atlantic. These canals are 100 feet wide and from 5 to 10 miles apart at the southwestern end of the lake. Instead of running parallel, they spread out more like a fan so that the

• Swinging a specially-built weed bucket equipped with steel plates, one of Fritz C. Stein's Bucyrus-Erie 10-B's builds a small levee along a Florida farm irrigation canal.



• Dragline No. 2 excavates a lateral ditch in mucky going with a ½-yard Corten steel bucket. Note 7 x 32 inch jumbo treads that enable the machine to navigate the soft places.

southern most canal empties into the ocean at Miami and the northern most at Stuart, some hundred miles up the coast.

From these main canals flow sub-canals from 8 to 10 feet wide into which the farmers connect their own ditches. The ditches have to be cut about every 660 feet for most crops, and then laterals are put in as needed. With ditches running from 8 to 10 feet in width and 6 to 7 feet in depth, the laterals are mostly the width of a ½-yard dragline bucket with a depth of 2 to 3 feet.

On some of the farms it is possible to control the water table by means of gravity, that is by raising and lowering the water gates placed at the ditch and lateral entrances. But on most farms the water has to be pumped on or off the field as the occasion may demand. Strangely enough, the problem is a dual one of drainage and irrigation. A few days of hard rain, and the water table rises rapidly. But a few days of sunshine evaporates the water very quickly so that the table lowers as quickly as it had risen. The important thing is to maintain an even water table, and it depends upon the weather whether a farmer has to irrigate his land or drain it.

Of course, with the farmers so dependent upon a system of canals and ditches and laterals, about the most important tools in this district are those used to build and maintain this system. Draglines are used almost exclusively for this work.

As an example of what these machines mean to the district, consider the case of one farmer who had his whole crop threatened by rising waters due to heavy rains. The canal was within a few inches of flowing over the dyke onto his farm when he called Fritz C. Stein of Belle Glade and asked him to bring over one of his Bucyrus-Erie 10-B draglines. That was at noon. By nightfall, Stein had raised the dyke along the edge of the canal by digging muck from the canal bottom and placing it on the sides of the bank. In half a day, at a cost to the farmer of about $95, the farmer's whole crop had been saved. The $95 investment had resulted in a savings of approximately $105,000, the market value of the celery, cabbage and escarole crop on the 250 acres threatened.

From Farmer to Contractor

The 10-B dragline was one of two owned by Mr. Stein. He is a farmer himself and cultivates about 2,000 acres. When he bought his first 10-B about six years ago, it worked so well, that his neighbors wanted to use it too. For about five years this machine maintained the ditches and canals

(Continued on page 311)

Maintaining San Bernardino's Highways

The largest county in the United States, San Bernardino keeps a 3,447-mile highway system shipshape by efficiently coordinating the operations of its men and equipment

By FLOYD SUTER BIXBY

BRRING! The jangling telephone cut short the conversation between the chief and four of his best motor patrol operators. George Knoop picked up the receiver.

"It's for you, boss." He handed the telephone to Ralph Motherspaw, assistant highway commissioner of San Bernardino County, California.

Assistant Commissioner Motherspaw scowled. "Barton Flats Road? Twenty miles from Redlands, you say? Is the bus turned over or wrecked? That's bad, all right. Try to get the boys out and keep them from freezing to death. We'll be right up."

Harvey Axley, another motor patrol operator, was already pulling on his gloves. "Bus turned over?" he asked. "Or just caught out in the snowstorm?"

"Worse than that, boys. There's a load of Boy Scouts marooned up there somewhere on the Barton Flats Road in a turned over bus. Just why they'll go up there during a snowstorm I don't know, but they're in a Hell of a spot right now!"

"Yeah, it's tough," Axley agreed. "I got one at home myself about that age. Glad to know he's safe."

"Well, boys, we've got to get them out if we can. Axley, you get out the snowplow. Ward Addis and I will go on ahead. We've got the bulldozer within a mile of there now, thank God. We'll have her warmed up by the time you get there. Carris, you stay here and answer the telephone. Hurry, now, boys."

Within a few hours, two full diesel motors, "revved" up to a snarling roar, had pulled back from eternity a busload of Boy Scouts stranded on the brink of a

• A San Bernardino road near Yucaipa is given a coat of oil mix material by a Caterpillar No. 12 diesel motor grader equipped with a Gardner oil mixer.

cliff in a blinding snowstorm, and got them back to town safe and sound. To Ralph Motherspaw, it's all a part of the day's work. These are not the things he talks about. That story, giving credit to whom it was due, came from Howard L. Way, the county highway commissioner, who is Motherspaw's boss.

To look at Mr. Motherspaw and a map of the county at the same time would be to agree that here is a man whose size matches the magnitude of the task before him. Weighing better than 200 pounds, this big, efficient engineer directs a county road maintenance program so large that it eclipses the average county setup by many miles. For San Bernardino County is the largest county in the good old U. S. A. and it covers everything unusual under the sun.

A long strip of land from the Los Angeles back door all the way to the state lines of Arizona and Nevada at the Colorado River, San Bernardino consists of 20,157 square miles of county. You could crowd all the eastern states of Massachusetts, New Jersey, Delaware and Rhode Island in this area and still have plenty of elbow room in the corners to land one of the big catfish out of the

• San Bernardino County headquarters at San Bernardino, California, is the maintenance hub of a 3,447 mile road system.

• Material for oil mix operations is screened on the spot by a ⅜-yard Bucyrus-Erie shovel loading to a truck equipped with a specially built screen.

• Excavation of a base for a new road is handled by one of the county's ⅜ - yard Bucyrus - Erie shovels loading material to a Ford truck.

Colorado River. During the past year San Bernardino had a mineral output of $15,000,000 and agricultural crops worth $25,000,000. Here in this county one-fourth of the citrus crops and one-sixth the agricultural products of the state of California are produced.

San Bernardino's Highway Mileage

Traversing the county are some 6,000 miles of highways of all types and classes. Of this total, 3,447 miles are maintained under the county maintenance department. These highways cover an altitude range of 11,845 feet, for some of them run at sea level in the 150 square miles of Death Valley in the county, and one of them winds up the side of stately Mount San Gorgonio, whose bald, snow covered head pierces the clouds. To properly service this broad highway system, the county operates more than 275 pieces of equipment, including 131 trucks, ranging in size from the light service type up to 8 ton size; 8 gas shovels, with ⅜ yard to 1½ yard dippers; 22 tractors; 14 motor graders; and 21 pull type graders and 10 road maintainers.

Perhaps the best way to illustrate that the highway maintenance schedule is both varied and unusual is to sit in the cab of a motor patrol with one of the county operators whose job is to service the highways in out of the way places in the desert. You check out of the shop in the city of San Bernardino on Monday morning, but this does not mean that you will check back in again at the end of day. For you are going out on a trip which will take in the desert roads in your particular district. You work toward a rising sun, and you are still working toward the east when the sun is behind you. You have worked all day travelling in the same direction. You have shivered in the cab high up in the mountains among the giant evergreens, and you have sweltered in the desert heat of as much as 125 degrees in the shade. You sleep sometimes in a rough camp under the stars, with rattlesnakes and coyotes for company; other times you stop at one of the small desert towns. Three or four weeks later you are back in San Bernardino with your family.

Funds for the maintenance program come from the annual motor tax revenue of $500,000. The state collects a 3 cent gasoline tax. Out of this amount 1½ cents is apportioned for state highways, 1 cent for county roads, and ½ cent for the upkeep of city streets.

Prior to 1915 the county had practically no motorized equipment. Individual supervisors handled what work was done in their respective districts, much the same as it is still handled in many other counties of the United States today. Under a charter adopted on January 1, 1915, a board of supervisors appoints a highway commissioner, who directs all construction, maintenance, repair and work on county roads, subject, of course, to the rulings of the board. On January 1, 1936 this board of supervisors combined the highway commissioner's office with that of county surveyor and engineer. This has resulted in better management of the county highway department and better county government.

The entire 3,447 mile maintenance system is recorded in special bookkeeping accounts set up for each section of road. In this manner, the exact cost of maintaining each portion of this system and each class of highway is known at all times.

Heavy Rains a Problem

While it may seem too much of a paradox to believe, one of the greatest problems of maintaining roads here in this southern California county is the danger from

• A drainage ditch to carry away "California dew" is excavated by a Gar Wood scraper and Allis-Chalmers tractor combination.

• San Bernardino County highway department tackles another flood control job as it puts a Bucyrus-Erie ⅜-yard shovel to work on a new stream channel excavation job.

heavy rains twelve months out of the year. During the months from November to April, the western part of the county is always subject to rain, for this is the regular winter rainy season. But this county reaches far eastward, across the mountains into the desert lands, and here during the summer months cloudbursts occur. According to Commissioner Way, if you haven't ever seen one of these cloudbursts you haven't really lived.

The rain drops down in sheets, falling so fast that the desert ground cannot possibly absorb it as it falls. Before long the whole desert is covered with water many inches deep, so that it seems to be a huge lake. Last September, during a heavy cloudburst, enough rain fell in the Parker Dam vicinity to raise the lake, already 50 miles long, 9 feet. And this 9 feet built up in the big lake with all the spillways of the dam in open position.

At times like this Assistant Commissioner Motherspaw gets uneasy about his roving maintenance men. Not knowing exactly where they are, he hunts the general locality where they are working until he finds them safe. For these trips he goes out by airplane, covering hundreds of miles at great speed.

Erosion along the desert roads from these storms is great, and the damage must be repaired immediately by the motor patrol operators. Near San Bernardino and the urban area, runoff water from the mountains floods the streams and tears out bridges and banks. An ingenious system of flood channels designed to spread the water out in channels over the country plus a dam system in the San Gabriel Mountains, has relieved this flood danger greatly.

San Bernardino County has pioneered the construction of new roads into Death Valley, it broke the trail into the Lake Arrowhead region where heavy snowfalls occur in winter within sight of the citrus groves down in the valley, and it was the first county in the United States to adopt a white line in the center of the highway. A city engineer of Redlands originated this. Concrete, impractical and expensive for the desert regions, was replaced by black top plant mix type road, and thousands of miles of this road are in service throughout the country. This type of road is well suited to the desert locations where traffic is light. Some experimental work is also being done with soil-cement stabilization.

The soils of the county are especially well adapted to the plant mix surfacing. While some clay and adobe is found, in most places the natural material is gravel and decomposed granite. Often the oil can be applied directly to the subgrade as it is found. Where it is not quite right, it can be easily mixed with a small amount of fines taken out of adjacent wash beds. The aggregate is cultivated to the proper consistency and liquid asphalt is spread. Slow or medium curing asphalt of the low viscosity type is used in amounts varying from 1½ to 2 gallons per square yard. It is mixed with the soil with special oil mix machines, although good results have been secured with tractor drawn graders and motor patrols. Compaction is done with sheepsfoot rollers, or simply by turning the road over to traffic. An application of seal coat seems to add to the riding qualities and to the durability of the wearing surface.

Excavating Mix Material

Where it is necessary to dig additional material for the mix, Assistant Commissioner Motherspaw has designed a handy little invention. A portable screen, which can be lifted up to a truck

(Continued on page 296)

EXCAVATING ENGINEER

FOUNDED 1911

A Monthly Publication

Devoted to the Excavating Industry

The Excavating Engineer Publishing Co.
South Milwaukee, Wisconsin

F. O. WYSE, *Manager* — ARNOLD ANDREWS, *Assistant Manager*

D. B. REED, JR., *Editor* — M. J. BARGENQUEST, *Associate Editor*

JOHN J. MORAVEC, *Art Director* — DELMAR COHEN, *Assistant Editor*

E. M. HEUSTON, *Sales Manager* — E. F. BRIESEMEISTER, *Assistant Editor*

"For the Want of a Nail . . ."

Editor's Note: This editorial appeared in the March 20, 1941 issue of the New York World-Telegram and is reprinted by their special permission.

Eighty American-built bombers are grounded in Canada because each lacks one small but vital part —a part that is supposed to be produced at a plant in Staten Island, New York. A strike, which began March 3 and lasted 15 days, stopped its production.

A strike ties up a small die-casting plant in Los Angeles. Four great airplane factories on the Pacific Coast depend on this plant for castings. Production of military planes will be slackened.

A plant in Bridgeville, Pennsylvania, was turning out propellers for bombers. A strike was called. For lack of propellers, new bombers will be earthbound. This plant also made a small part for bomb fuses; a Chicago factory has had to stop assembling fuses. The plant also made a small part for the turbo-supercharger which enables bombers to reach great heights; for lack of this part, manufacture of the superchargers has halted.

The big new powder plant at Radford, Virginia, can't get into full production until certain electric generators arrive — and the generators lie unfinished at the struck Allis-Chalmers plant in Milwaukee. Completion of another powder plant at Charlestown, Indiana, is held up for the same reason.

A stoppage of work at some isolated plant you've never heard of, directly involving only a few men, may seem trivial. But it can throw important defense assembly lines out of gear.

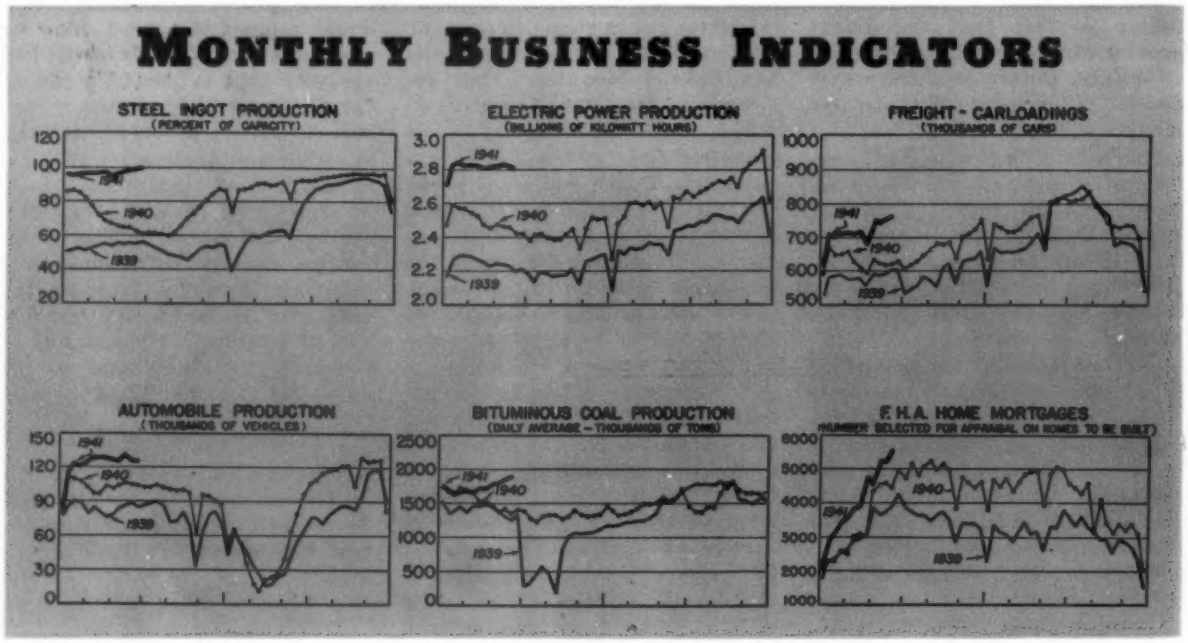
It doesn't matter much whether Congress appropriates seven billions or 70 billions or 70 cents— if we cannot get uninterrupted production of all the parts of all the munitions needed by our own armed services and by those abroad who are doing the fighting.

"For the want of a nail the shoe was lost,
For the want of a shoe the horse was lost,
For the want of a horse the rider was lost,
For the want of a rider the battle was lost,
For the want of a battle the kingdom was lost—
And all for the want of a horseshoe nail."

President Roosevelt has now appointed a national defense mediation board to undertake the formidable task of ending these stoppages in our "horseshoe nail" factories, and of averting others. Chairman Clarence A. Dykstra and the other 10 members are men of accomplishment in the fields of industry, labor and public service. They are given great responsibility but little statutory power. Their success depends on the cooperation they get from employers and unions.

The mediation-board setup has worked well on the railways, where a statute prescribes cooling-off periods and definite procedures for negotiation, conciliation, arbitration and fact-finding. It remains to be seen whether this new board can make a voluntary mediation system work in the enormously various and complex field of defense manufacture.

But if the threat to our national safety is serious enough to warrant the back-breaking outlays which Congress has voted, and which the people must finance, it is also too serious for the toleration of sleazy opportunism, of the grab-it-while-the-grabbing's-good attitude, of the refusal by a few to recognize that this national emergency imposes duties on leadership, in both industry and



labor, transcending the rights they both enjoy in ordinary times.

If those duties are not shouldered voluntarily, they will have to be imposed by statute.

Hats Off to the Quartermasters!

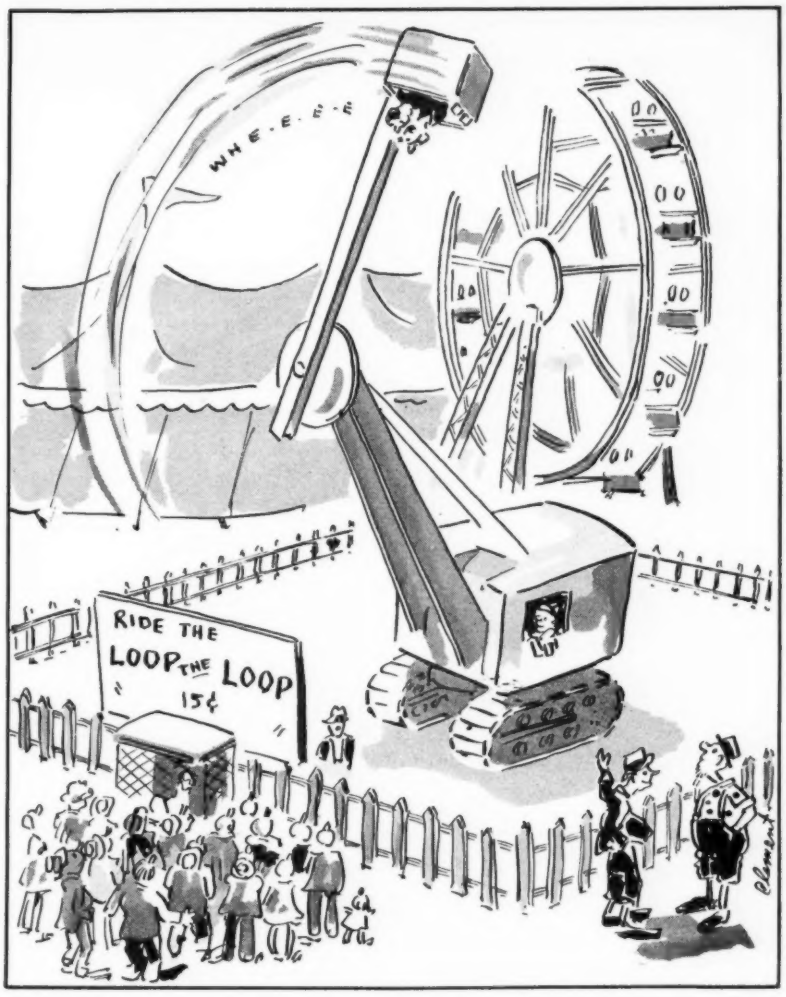
There has been a good deal of criticism in the public press about the slowness of progress on the defense program. We rather believe that most of this is based on a lack of appreciation of the magnitude of the job to be done.

Your editors have just completed visits to many of the army camps through the south and can offer testimony to the remarkable speed and efficiency with which these tremendous undertakings have been carried through. On each project we visited, men and equipment were working at top speed and remarkable efficiency considering the necessity of building up extremely large organizations and coordinating them to function on projects of gigantic size in an extremely short period of time.

Take Fort Bragg as an example. Here the Construction Quartermaster Corps is building accommodations for 67,000 men . . . a good sized city in itself, involving housing, theaters, hospitals, mess halls, streets, drainage, sewerage, water works, lighting, heating, and administration. Work was started about the middle of September and, at the time of our visit, five months later, over 23,500 construction workers, with a tremendous amount of machinery and equipment, were functioning smoothly, speedily and effectively. Many sections of the camp had already been turned over for occupancy to the army and the entire project will be finished well ahead of the planned completion date of May 15.

The only camp that we found behind schedule was at Hollyridge, North Carolina, where the necessity of securing an isolated position for an anti-aircraft artillery range prompted the selection of the site on swampy ground involving an excessive drainage problem and the necessity of excavating to hardpan for foundations of all streets and major buildings.

In no small measure has the success of the Construction Quartermasters been due to their policy of handling the work through contractor's organizations.



"There's no end to Steve's ingenuity!"

Highway Intersections Emergency Airports?

In visiting some of the many airports now under construction as defense projects, it occurs to us that we are building up a tremendous investment in "plant" which must be further augmented by emergency landing fields which will be used for defense or commercial purposes but a small percentage of the time.

Might it not be possible to combine this emergency type of airport with some other regularly used requirement for normal peacetime pursuits?

For instance, might we not develop runways of the proper width and length at highway intersections not subject to too heavy travel and thus gain extra use for the paved runways, the economy of a standardized maintenance system, plus the use of existing highways?

Construction costs would include removal of overhead wires and poles, grading and widening the pavement strips to provide suitable length of wide runway, covering ditches, and possibly the installation of suitable traffic lights to protect a landing plane from highway traffic.

Maybe it's a crazy idea, but it seems a shame to invest the money necessary to improve a lot of cow pastures that will probably rarely see an airplane a week unless we are engaged in active warfare. Widely scattered "crossroad airports" of this type would certainly have offensive and defensive advantages over the concentration of numerous planes at regular landing fields.

The improved crossroads would be welcome additions to our nation's highway system. They would also provide an excellent network of emergency fields for peacetime plane traffic.

Equipment

you ought to KNOW ABOUT

For further details about the equipment on this page please write to the manufacturer, mentioning Excavating Engineer.

Motor grader

Manufacturer: Austin-Western Road Machinery Company, Aurora, Illinois.

Claims: Powered with a dependable 31 hp gas motor; weighs approximately 8,000 lbs., and uses a mono, rail box-type frame that averages 50 lbs. to the foot. Has five speeds forward ranging up to 14.8 m.p.h. and a reverse speed. Scarifier and blade lift are operated by a hydraulic control such as is used on machines selling at

much higher figures. Side shift and circle reverse are hand operated from the cab. Also equipped with a wide front axle with ample ground clearance to straddle windrows; front wheels spaced to track with rear drivers; rugged draft beams with ball-joint connection; large diameter circle and heavily braced blade supports. Standard equipment includes an 8-ft. blade, hydraulic wheel brakes and parking brake.

Diesel engine

Manufacturer: Mack Trucks, Inc., Long Island City, New York.

Claims: Designed for installation in four-wheel truck models of the 24,000-26,000 lb. gross vehicle weight range. Has a piston displacement of 405 cu. in. and bore and stroke of 4" x 5⅜". Operates at the maximum governed speed of 2,200 r.p.m. and develops 107 h.p. at that speed. Maximum torque at 1200 r.p.m. is 308 lb. ft. Cylinders and crankcase are cast in block with removable dry cylinder sleeves. Thirty-two studs hold down the two detachable cylinder heads. Overhead valves are operated by pushrods, rockerarms and double concentric valve springs. Seven main bearings support the 147 lb. fully counterbalanced crankshaft and camshaft. The use of 35 degree cap angle allows the connecting rods to be withdrawn through the cylinders without disturbing the main bearings. Lubrication passages are rifle-drilled out of the solid iron. Oil is fed under fixed pressure and cooled by water jackets and the flat top of the crankcase. Oil filter is built onto the crankcase and uses no external connections. Timing and accessory drive is through a train of helical gears. Cold-circulation thermostatic system of temperature control is used in connection with a thermostat and directed water flow.

Tractor-trailer

Manufacturer: Mack Trucks, Inc., 34th Street and 48th Avenue, Long Island City, New York.

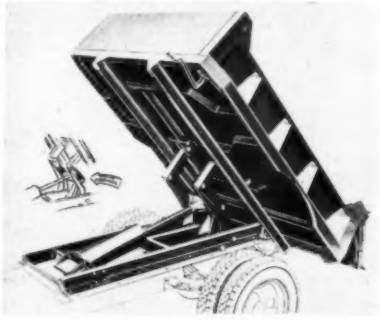
Claims: This powerful and high-powered new model LFT tractor in combination with a sturdy Easton semi-trailer is offered for quarry operations which

require negotiating stiff grades. The Mack tractor, a unit of 140" wheelbase has a powerful six-cylinder engine of 4¼" x 5⅜" bore and stroke, and is perfectly suited for this type of work, combining efficiency, dependability, and economy of operation. The semi-trailer unit of this combination is manufactured by the Easton Car and Construction Company of Easton, Pennsylvania. Body is side dump and of 13 cubic yard capacity.

Rubber insets

Manufacturer: Anthony Company, Streator, Illinois.

Claims: Used in their complete line of Super Hoist models to prevent both "over-run" and "kick



back" (the inherent tendency of a dump body to rear over backwards) when dumping a load or spreading gravel. These special rubber insets give a new use for rubber in the manufacture of hydraulic hoist dump bodies. Light in weight and positive in operation they replace awkward, heavy chains and springs usually required in an attempt to control this evil. This new feature, as well as other outstanding Anthony features, such as low loading height, "push pull"-dash control that works like choke button, telescopic subframe and double arm power-speed hoist, is to be found in the complete Anthony line for 1941.

Carrimor CW-10 scraper

Manufacturer: LaPlant-Choate Manufacturing Company, Inc., Cedar Rapids, Iowa.

Claims: Hydraulically operated. Designed for use with the new rubber-tired tractor made available by the Caterpillar Tractor Company. Loads and transports at speeds up to 18 miles per

Over 4,000,000 miles FREE

OF SLUDGE TROUBLE AND RING-STICKING!

This overhaul-saving performance convinced Mr. Arthur Kern, Vice-President of the Brown Avenue Transportation Company, Toledo—

"That RPM DELO is superior in all characteristics to any other oil tested.

"For the past two years we have been using RPM DELO in our fleet of 25 General Motors Diesel engines. Our operation in Ohio, Indiana, Illinois and Michigan represents over 2,000,000 miles per year of severe travel.

"Reliable performance is something we *must* have and due to the freedom from sludge and freedom from ring-sticking we enjoy through the use of RPM DELO, we are able to maintain our heavy schedules."

Besides eliminating ring-sticking and sludge trouble, RPM DELO also stops filter clogging, prevents bearing corrosion. And it reduces engine wear remarkably because of its unique ability to *stay put* and lubricate superheated surfaces which other oils tend to leave dry.

RPM DELO has cut overhauls down as much as one-half; cut engine repair costs as much as 58%. See what it can do for you, now!

ORDER RPM DELO *Unequaled* FOR YOUR DIESELS

Approved by the makers of over 95% of the installed Diesel horsepower in America, RPM DELO is marketed under the following names:

RPM DELO
Kyso RPM DELO
Diol RPM DELO
Sohio RPM DELO
Signal RPM DELO
Caltex RPM DELO
Imperial RPM DELO

Ask your Diesel engine manufacturer or distributor for the RPM DELO supplier in your locality.

RPM DELO
REG. TRADE-MARK
DIESEL ENGINE LUBRICATING OIL

STANDARD OIL COMPANY OF CALIFORNIA

For your convenience in writing to Standard Oil Company of California, you will find a card bound in this issue.

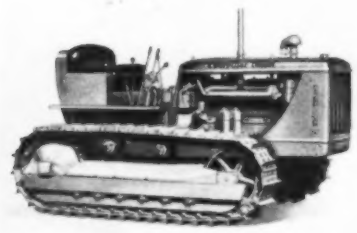
hour. Free from overhead obstruction so that it can be loaded by dragline or shovel, if desired. Easier and faster loading made possible by the bowed design of the cutting edge. Improved guide arrangement insures correct operation of the rear ejector gate. Other features include: honeycomb construction of bowl bottom

for greater strength and rigidity, independent apron operation which permits uniform spreading of any material, chromium plated piston rods on the hydraulic jacks eliminates rusting, pitting, and corrosion. Has a capacity of 8.75 cu. yds. struck, and 10 yards heaped.

Diesel tractor

Manufacturer: Caterpillar Tractor Company, Peoria, Illinois.

Claims: Separate control unit does the work by hydraulic pressure when only 14 pounds of pull are exerted on the steering clutch levers. Added comforts and improvements for the driver. Has nine working speeds — five forward and four reverse corresponding to the first four. Welded steel construction used extensively. Steering clutches are individually removable without disturbing the final drive or the large



bevel gear that drives the clutches. Powered by a six-cylinder Caterpillar diesel engine, with a bore and stroke of 4¼" x 5½" and a full load governed RPM of 1400. Engine completely sealed against dust. Fan belt and valve clearance are the only working adjustments. Equipped with fuel and lubricating oil filters. No. 2 and No. 3 furnace oil can be used as

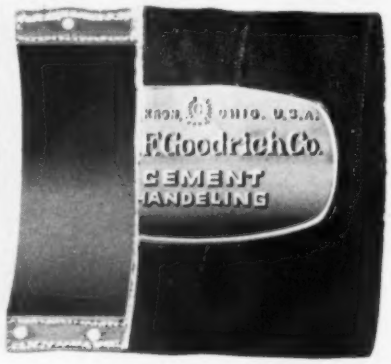
For further details about the equipment on this page please write to the manufacturer, mentioning Excavating Engineer.

fuel. Many parts have been given the "Hi-Electro" induction hardening treatment. Wide variety of allied equipment has been designed for the new tractor.

Cement-handling hose

Manufacturer: The B. F. Goodrich Company, Akron, Ohio.

Claims: Meets operating conditions created by new techniques in bulk handling of cement. Used by cement manufacturers and contractors with machines which operate like a giant vacuum cleaner, sucking up the cement

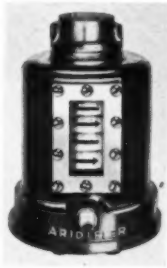


and blowing it through the hose at high velocity. All the operator does is to keep pushing the machine into the pile of cement. The new hose is made with a ⅛ inch tube of Armorite, a specialized rubber compound designed to resist abrasion, strong wrapped fabric and round wire reinforcement, with a 3/64 inch rubber cover. It comes in inside diameters ranging from 4 to 6¾ inches.

Aridifier air cleaner

Manufacturer: Logan Engineering Company, 4912 Lawrence Avenue, Chicago, Illinois.

Claims: Equipped with a window set in the housing wall to show the user just what happens inside and to prove that backpressure is a negligible factor. When the rotors are at operating speed, it is a simple matter to see each rotor from the bottom up discharge drops of water and oil and flecks of dirt as they are removed from the air stream and deposited in the dead air zone. These units will remove all condensed moisture, oil and fine scale from air and gas lines and that



even under 24 hours per day continuous operation no maintenance is required as rotors are balanced on grease-packed bearings and there are no parts to wear, clog or become inoperative. Units need no attention other than periodic drawing off of accumulated water and dirt from the traps.

Unitilt bulldozer

Manufacturer: The Buckeye Traction Ditcher Company, Findlay, Ohio.

Claims: For use on all makes and models of tractors. The name of the new design is derived from the patented tilting device and the universality of the frame, which permits using either Buckeye bulldozer or trailbuilder moldboards on the same frame. This latter feature eliminates the original investment in two frames in order to have both bulldozer and trailbuilder and further simplifies changing over. One man can change moldboards, which can be dismounted from the tractor by pulling two kingpins. The sidearms and other parts stay in place. The tilting device is located on one sidearm and permits raising or lowering bulldozer or trailbuilder blade at either end a distance of 12 inches. Turning one bolt only is all that is required to effect the tilting adjustment. Has many other new design features.

Lubrication barrel pumps

Manufacturer: Stewart-Warner Corporation, Chicago, Illinois.

Claims: New and highly efficient, especially designed for heavy duty usage by contractors. A number of new models to meet a variety of requirements. All pumps are equipped with Dynamatic Primer, a new feature which enables these installations to handle heavy fibrous lubricants with ease. All pump castings are of fine grain cast iron of high tensile strength. Lasting service is assured because the wearing

WHEN THIS POWER *cracks the whip* ...YOU GET ACTION!

HERE'S engine-horsepower and sure-footed traction that combine to deliver big power where it does the most good: *Right at the drawbar!*

You get *action* . . . with big loads, in bad weather, over difficult ground!

And it's *steady* action! Not only because of "Caterpillar" Diesel's big-load moving power, but also because these machines are built for long-term heavy duty. Down-time is lowered—*and schedules kept up*—by such "Caterpillar" features as copper bellows-seals to guard against mud, water and grit . . . and by the "Hi-Electro" hardening which gives cylinder liners, crankshaft, roller rims and shafts, track pins and other important parts *more wear-resistance* than can be had by any other practical heat-treatment method! And down-time takes a further licking from "Caterpillar's" parts-and-service organization—*unequaled in its field.*

Pay-loads moving on time—and all the time . . . you can count on that with reasonable certainty when you put "Caterpillar" Diesel Tractors in charge of the moving!

• Relocation of Route 29, near Tamaqua, Pennsylvania. 180,000 yards of material to move. Working 20 hours a day, each of these units ("Caterpillar" Diesel D8 Tractor with an Athey wagon) handles 300 yards! All equipment pictured is owned by the D. A. Kessler Construction Company, Mount Carmel, Pennsylvania.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ENGINES AND ELECTRIC SETS

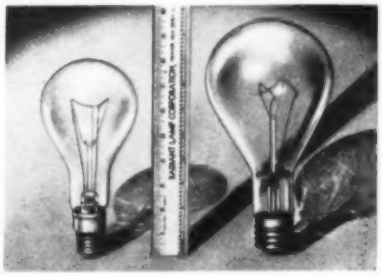
TRACK-TYPE TRACTORS • ROAD MACHINERY

surface of the cylinder is hard chrome-plated over cast iron.

High-wattage lamp

Manufacturer: Radiant Lamp Corporation, 190 Sherman Avenue, Newark, New Jersey.

Claims: Enables industries working nights on the defense program to increase their illumination up to 250% or more without changing fixtures. The use of

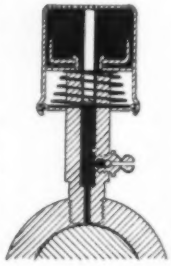


a hard glass bulb has made it possible to reduce the size of a 500 watt lamp to that of an ordinary 200 watt lamp, and also permits the lamp to withstand thermal shocks when used outdoors. Originally designed for use in explosion-proof fixtures. In place of the large "mogul screw" base and heavy fixture necessary to support the weight of an ordinary 500 watt lamp, the new lamp can use a "medium screw" base like those in ordinary household fixtures. The hard glass Radiant lamp is said to withstand the sudden shocks of rain or sleet without cracking.

Ace automatic lubricator

Manufacturer: Ace Lubricating Equipment Company, Inc., 2345 West Grand Blvd., Detroit, Michigan.

Claims: Replaces all types of grease fittings and oil cups. Indicates at a glance when refilling is necessary. Eliminates waste, dirt and loss of time because it is filled with a gun. Can be taken apart, cleaned and put back on the job in a minute. Is adjustable to suit bearing fits and lubrication requirements. Eliminates over and under - greasing. Maintains constant pressure on the bearing excluding dirt, dust and water. Assures constant lubri-



For further details about the equipment on this page please write to the manufacturer, mentioning Excavating Engineer.

cation to all areas of the bearing. Equipped with safety valve which prevents damage to cup when high pressure gun is used. Readily adaptable to most sleeve bearings and bushings and adaptors make it available for bearing openings other than standard.

Amsco Mo-Mang welding rod

Manufacturer: The American Brake Shoe and Foundry Company, 389 East 14th Street, Chicago Heights, Illinois.

Claims: Low cost manganese-molybdenum steel welding rod for building up worn high manganese, carbon steel and grey iron castings. Available in 18″ lengths, in

the bare form, for straight D. C. welding and in the combination coated form for both D. C. and A. C. application. Supplements Amsco nickel-manganese steel rod. Proving satisfactory and economical as a build-up welding rod for parts that have become worn from abrasion rather than impact.

Koehring trail dump

Manufacturer: Koehring Company, 3026 West Concordia Avenue, Milwaukee, Wisconsin.

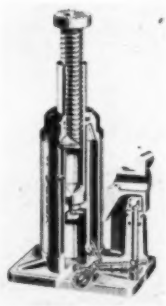
Claims: Twelve cubic yard capacity Trail Dump added to the 8 and 10 cubic yard size. Increased body strength and improved "automatic hand" winding mechanism. General Motors, two cycle, diesel engine furnishes steady and dependable power. Gasoline engine power is also available.

Detachable disc wheels and tires on rear of tractor, interchangeable with rear wheels and tires on wagon. Passes from experimental stage, as a result of one year of field service on contractors' jobs, to release for general sale.

Heavy duty hydraulic jack

Manufacturer: Templeton, Kenly & Company, Chicago, Ill.

Claims: Made in 3, 5, 8, 12 and 20-ton capacity sizes. Design and construction advantages include neoprene oil resistant seals, pressure - tested malleable iron top nut and base, a machine ground ram, a fully lapped cylinder, ball type valves, needle type load release, center ram for proper balance and a convenient carrying handle. Operating features include lower closed height, higher raised height, lighter weight, leakproof design and provision for operation in either a vertical or horizontal position. Ruggedly constructed for heavy duty service. Tested to one and one-half times their rated capacity to insure satisfactory operation and safety for operator and load.

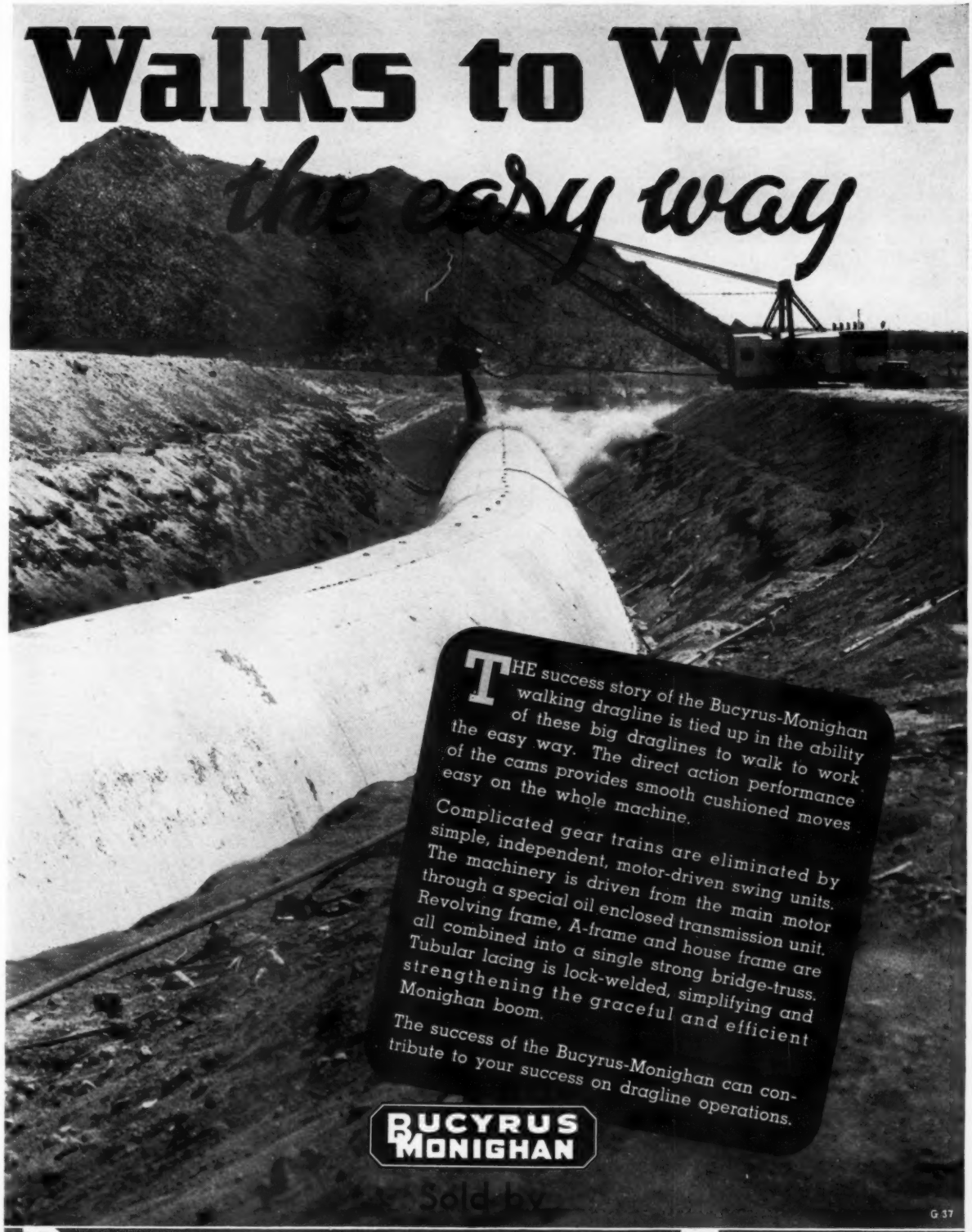


Flexible Coupling

Manufacturer: The Falk Corporation, Milwaukee, Wisconsin.

Claims: Especially designed for connecting diesel, oil, gasoline, or gas engines to any type of driven machinery. For use with motor driven compressors, single cylinder pumps and other driven equipment of a similar fluctuating torque nature. Built to satisfy the need for a flexible coupling in which the degree of resiliency can be readily changed to suit the exact requirements of a particular application. Consists of a special resilient rubber gland lined with a pre-moulded, pre-vulcanized cylindrical section especially treated to prevent air loss. This cylindrical lining is covered with multiple alternating layers of tough durable fabric and live rubber, the entire gland is permanently bonded to rugged steel inner and outer rims. A rubber covered metal cap prevents foreign material from entering the valve. The degree of elasticity in this coupling can be varied by changing the air pressure. They are made in six standard types to meet a variety of requirements.

Walks to Work *the easy way*



THE success story of the Bucyrus-Monighan walking dragline is tied up in the ability of these big draglines to walk to work the easy way. The direct action performance of the cams provides smooth cushioned moves easy on the whole machine.

Complicated gear trains are eliminated by simple, independent, motor-driven swing units. The machinery is driven from the main motor through a special oil enclosed transmission unit. Revolving frame, A-frame and house frame are all combined into a single strong bridge-truss. Tubular lacing is lock-welded, simplifying and strengthening the graceful and efficient Monighan boom.

The success of the Bucyrus-Monighan can contribute to your success on dragline operations.

BUCYRUS MONIGHAN

Sold by

G 37

Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSIN

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

TVA *Methods*

(Continued from page 271)

allow adequate development of this technique. Some of the less technical considerations include the improvement of each new issue by stressing of important considerations and elimination of the obsolete or controversial portions; prepared standard data sheets for review of the most desirable mechanical or performance characteristics; statements requested as to maintenance or operating recommendations, availability, and service on spare parts, and possibility of interchange with existing equipment, as for accessories and attachments. Drawings, prints, and sketches for approval of manufacture and careful attention to administrative details such as freight classification, wage scale, mill reports, defects warranty, shipping lists, etc., are but a few more of the many considerations encountered.

After receipt of the bid prices, a short period is reserved for analysis of offers and final recommendation for purchase. The information from various bidders is spread on a 22″ x 30″ sheet giving all the major specification points. Items not meeting specifications are called to attention by distinctive markings. Included in the analysis are such points as: shipping point, freight, shipment and delivery dates, repair parts, stock, weight, cost per pound, evaluation of varying points, etc. Following the award, the shop or field inspection, the traffic routing and expediting, and the job receipt and recording are additional successive steps necessary to complete a proper acquisition.

Installation of Equipment

During the installation period, things really "hum." Machines and assemblies must fit. New devices are explained and changes are carefully thought out. "Let's get under production" is the order of the day, and the natural ability of the construction man rises to meet the occasion. The installation of heavy machinery and the final planning of operation of mobile equipment is a major job in itself. One construction engineer recently remarked that he considered his job half completed and they hadn't moved a cubic yard of pay dirt! They had spent many long hard shifts, though, building access roads, erecting shops and camps, installing facilities, and organizing forces. He was somewhat like the master mechanic of a large mill who said he likes to see his maintenance men working casually. He then knows they have things well under control.

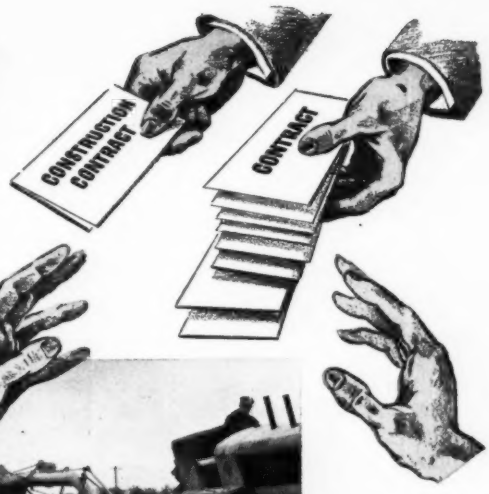
Several early problems are solved by carefully planned operations and by aids to erection by predetermined steps and sketches. At Pickwick Landing Dam the superintendent designed a pipe frame template to replace the usual timber rings for sheet piling guides. This idea was also used on later jobs. In some cases, a full jump ahead of the rush and hurry is possible by use of existing conditions before excavation. For instance, a 100-ton power shovel on one TVA operation was assembled at a rail terminal and floated right into the cofferdam area, where a crib above water level received the machine. An easy ramp after unwatering allowed early production and relieved the congested cofferdam area of another crew to assemble the equipment. In a similar manner compact loading on trailers allows the delivery of many units, ready to operate. Photos, notes, and sketches of equipment on the cars as it comes in, all assist in later loading out operations. Check lists, erection drawings, and inventories of installed items are made as soon as possible.

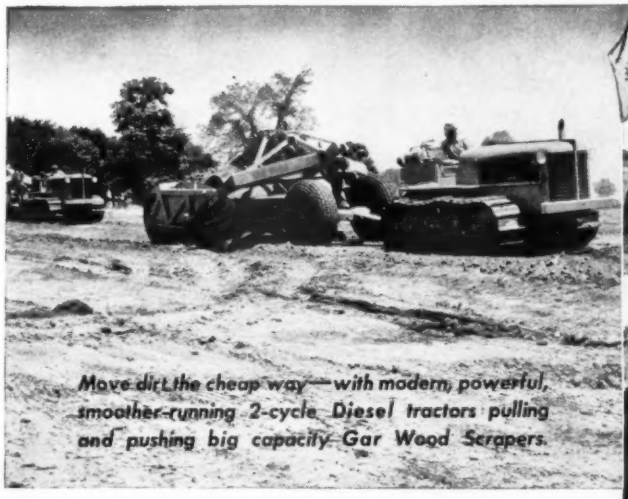
One interesting incident occurred on a project in the Southwest in the operation of a large cableway, where a fire broke out in the operating control room. Much auxiliary equipment was damaged almost beyond recognition. Serial numbers and name plate data were completely destroyed. Fortunately, the manufacturer's designer was at the factory, and he was able to go to stockroom and assemble the needed replacements. Also fortunately there was a duplicate machine, although it was half way across the country. As it so happened, the numbers of the damaged parts were supplied by the owner of the duplicate machine and the cableway was in operation in good time. Where such favorable conditions were not existent, how much would a good receiving and erection report be worth to a job just getting under way with probably a tight schedule ahead to beat weather or completion difficulties?

The first operating and adjustment stages are largely responsible for the job attitudes of the future and the set opinions whether the machine is a "jinx" or a "honey." Used equipment from a previous job is usually accompanied by experienced operators and mechanics, allowing real economies on the machine operation and elimination of early

• TVA ships a compact load of four locomotives by trailer over highway to the rails of a transfer track where they will be ready to roll on their own.

Help yourself to a BIG YEAR





Move dirt the cheap way—with modern, powerful, smoother-running 2-cycle Diesel tractors pulling and pushing big capacity Gar Wood Scrapers.

Handle more heavy grading and construction hourly, at less cost, with the more flexible Leaning Frame Grader and with the extra-earth moving capacity of the NEW Model A-D Motor Grader.

Finish up mean jobs in a hurry and at a profit with this Model WM tractor and Hough Shovel. You'll find dozens of uses for this outfit!

Smooth out hauling roads... keep finished work in shape with this low cost W-Speed Patrol. Ideal for light grading and maintenance!

Get Them While They're Hot! Don't Let Old Equipment Hold You Back . . . Modernize Now With A-C Cost-Cutting Pacemakers!

The Construction job ahead almost staggers the senses. Too big to visualize—we only know there's plenty of work to be done . . . and to be done now. Already . . . first eight weeks of 1941 public construction awards top corresponding 1940 period by 123%.* If you aren't getting your share, check up on your equipment. Now is no time to drift! Let your Allis-Chalmers dealer streamline your outfit. He has today's tools . . . to handle today's work—a modern, complete line to fill any dirt-moving need. See him . . . NOW.

* Engineering News-Record Weekly Report—2-20-41

ALLIS-CHALMERS POWER

TRACTOR DIVISION—MILWAUKEE, U.S.A.

TRACTORS, ENGINES, ROAD MACHINERY

IT DOESN'T COST . . *it Pays!*

For your convenience in writing to Allis-Chalmers, you will find a card bound in this issue.

production difficulties. Manufacturer's representatives are always available for constructive assistance, and factory specialists are supplied when needed for preliminary tuning up. Spare parts needs are covered adequately in most cases by local agents. On the job, inventories of needed replacements are made up, and the care to be taken with spare parts control is recognized by all job heads. Changing models, improved devices, check of inventories, special handling, and numerous other items are taken care of with a minimum of overhead and by a constant attempt to keep down surpluses of parts on hand.

At times job installation is overdone. One job was not going to have any trouble with some chutes that were known to wear rapidly; they built them strong and solid, well braced and thick. Later operating conditions showed, however, that even the most minor inspection and cleaning necessitated a man crawling flat up into the pipe chutes. This took a half day of uncomfortable and dangerous work where an access arrangement could have been provided as the machine was installed.

Alterations and additions are often made, however. Drives are lengthened, grades are changed, reeving is improved upon. Electrical loads are checked, motor speeds altered, reduction gears varied, overdrives and special hoisting extensions are added. Holdbacks and accessories are added to conveyor flights, tire sizes are increased, and brakes are improved upon. Many of the major changes are passed on to all jobs. The adaptation of a safety shackle pin on a pile handling line perhaps saved more accidents and speeded up production in a greater proportionate measure than many other larger devices. As operation schedules go into effect, the production rate of particular units is studied and placed in line with the speed of the plant as a whole. Operating "bogeys" may be set up for guidance and check. Abuse and overload are observed and corrected at first notice. Every attempt is made to establish best habits of operating practices and thoroughly acquaint the operators with their responsibilities.

With these first steps in mind, we may now consider the day-to-day experiences of actual operation and maintenance. All the foregoing and following steps are carefully coordinated to provide economies to the organization as a whole, yet allow smooth going and individual job freedom and cooperation.

Figure I shows the major excavating items under consideration and indicates how central control is presented in summary form. This allows quick review of

TENNESSEE VALLEY AUTHORITY
CONSTRUCTION DEPARTMENT

	ITEM	KENTUCKY DAM	GUNTERSVILL
HAULING	LOCOMOTIVES	3 Locomotive 50 ton Steam Baldwin 1 Locomotive 75 ton Steam American	1 Locomotive 25T Diese Elec.
	TRACTORS BULLDOZERS WINCHES	1 Tractor Crawler 55 Gas Caterpillar 1 Tractor Crawler 70 Gas Caterpillar 1 Tractor Crawler D8h Diesel Caterpillar 16 Tractor Crawler D8h Diesel Caterpillar 6 Tractor Tired Rated 10 Bulldozer LeTourneau 10 Winch 2 Drum LeTourneau	1 Tractor Crawler D8h Diesel 1 Bulldozer LeTourneau 1 Winch 2 Drum LeTourneau
	TRUCKS	1 1YDT Dump White 2 1-1/2 T Stake Ford 3 1YDT Dump Mack 2 1-1/2 T Stake Dodge 6 6CT Dp Crawl Linn 2 1-1/2 T Stake Chev 1 Tank Wat. T 1 2 T Stake Ford 1 Fire Truck 2 2 T Stake IHC	2 4CT Dump Federal 4 1YDT Dump White 1 Fire Truck Howe
	TRAILERS	2 25 FT Trailers 10 Loader Wagons Fiorence 4 6CT Dump Rented	1 Loader Wagon Fiorence
	CARS	80 30CT Side Dp RR Koppel 20 30CT Bottom Dp RR FHEC 4 30 Ton Flat RR Birmingham	1 20 T Flat RR 3 Flat RR Wrecksde 2 4 T Push
AIR	DRILLS	6 Core Drill 3" Diamond Gas Sullivan 1 Core Drill 3" Diamond Gas DM 1 Core Drill 6½ Calyx Gas DM 1 Churn Drill 6" Gas DEM Co. 6 Drifter Wagon 3TT DR 2 Reeving Wagon DR 2 Reista WR Air DR 4 Jackhamer S-49 DR	2 Core Drill 6½ Calyx Gas DR 2 Drifter Wagon 3TT DR 2 Reeving Wagon DR 2 Reista WR Air DR 2 Jackhamer S49 DR 12 Posting Bar DTH50 CS
	COMPRESSORS	2 Compressor Portable 160 cfm Harrington 1 Stationary 300 cfm Rixon CP 1 Stationary 1060 cfm Rixon Sullivan 1 Stationary 2770 cfm Nordis-Tyrone	1 Portable 315 cfm Ingersoll 1 Stationary 1060 cfm Gas E.
EXCAVATING	SHOVELS DRAGLINES CR CRANES	1 Shovel 1-1/2 CY Convertible Gas RB 1 Shovel 1-1/2 CY Convertible Diesel RB 1 Shovel 2-1/2 CY Convertible Electric Marion 1 Dragline 6CY Diesel Monighan	1 Shovel 1-1/4 CY Convertible 1 Shovel 1-1/2 CY Convertible 1 Dragline 3/8 CY Gas Monighan
	SURFACING EQUIPMENT	2 Elevating Grader 68" Adams 4 15CY Carryall Scraper LeTourneau 1 Sheepsfoot Roller 5ft2 Taylor 1 Sheepsfoot Roller 68" LaPlant Choate 3 Tamper Barrfill Air CP	1 Scarifier Road Hugh Killian 2 Tamper Barrfill Air CP
	BUCKETS	1 Clam 1¼ CY RB 6 Clam 2CY RB 1 Clam 1CY Brin 3 Clam 2-1/2 CY Brin 1 Clam 1-1/2 CY Brin 1 Orad 2CY Page 1 Clam 1-1/4 CY Page 1 Clagt 3CY Brin 1 Clamshell 1/2 CY Brin	1 Clamshell 3/4 CY Rix Gas 1 Clamshell 1CY Brin 2 Clamshell 2CY Rix Gas 1 Dragline 1CY Williams

TVA 337 B (CON-1-39)
TENNESSEE VALLEY AUTHORITY

PROJECT _____
DATE _____

ENGINEERING & VALUATION DATA
NON-RATED EQUIPMENT

IDENTIFICATION DATA - BY _____

ITEM _____ SERIAL NO. _____ TVA NO. _____

SIZE _____ TYPE _____ MODEL NO. _____ JOB NO. _____

MANUFACTURER _____ ACCOUNT NO. _____

_____ CLASS NO. _____

PURCHASE DATA - BY _____

REQUISITION NUMBER	DATE RECEIVED	PURCHASE ORDER NUMBER	ACCOUNTING REFERENCE	NEW OR USED	ORIGINAL COST
					$

TRANSFER DATA - BY _____

	PROJECT	REQUISITION NUMBER	DATE SHIPPED	SHIP. TICKET NUMBER	ISSUING VOUCHER NO.	RECEIVING VOUCHER NO.
REC'D. FROM						
TRANS. TO						

VALUATION DATA - BY _____

INCOMING RESERVES $ _____ MONTHS COMPUTED _____ DEPR. RATE _____ TOTAL NET RESERVES $ _____

ISSUING JOB APPROVED BY _____ RECEIVING JOB APPROVED BY _____ TRANSFER VALUE $ _____

ENGINEERING DATA SUMMARY - BY _____

WEIGHT _____ DIMENSIONS _____

RATING OR CAPACITY _____

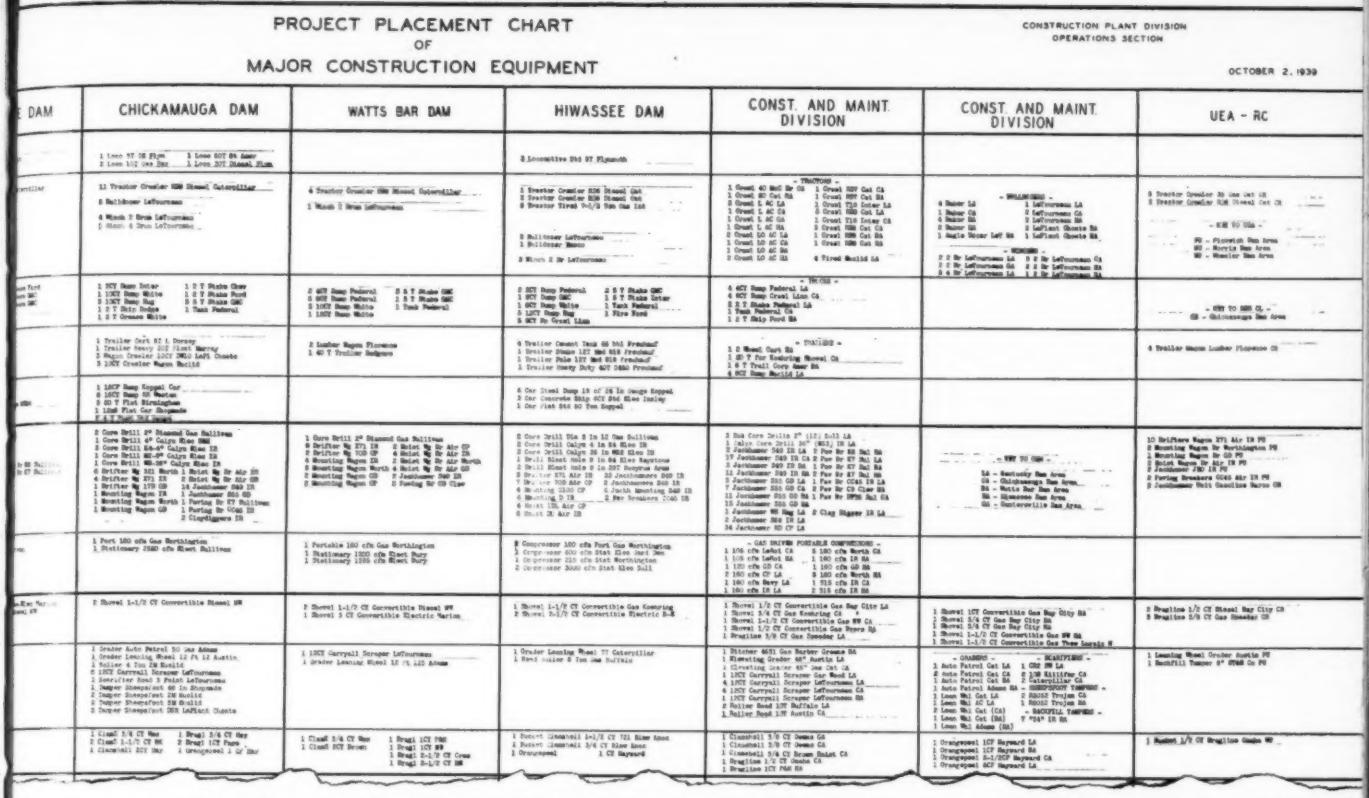
DESCRIPTION _____

POWER PLANT & DRIVE _____

AUXILIARY ATTACHMENTS _____

REMARKS _____

• FIGURE II—Complete engineering data on equipment is kept in duplicate by TVA Central and job offices on this loose leaf form.



PROJECT PLACEMENT CHART
OF
MAJOR CONSTRUCTION EQUIPMENT

CONSTRUCTION PLANT DIVISION
OPERATIONS SECTION

OCTOBER 2, 1939

DAM	CHICKAMAUGA DAM	WATTS BAR DAM	HIWASSEE DAM	CONST. AND MAINT. DIVISION	CONST. AND MAINT. DIVISION	UEA - RC
	1 Loco 57 Ton Plym 1 Loco 60T 84 Amer 2 Locos 40T Ore Dkr 1 Loco 30T Diesel Plym		2 Locomotive 30d 57 Plymouth			
	11 Tractor Crawler 80H Diesel Caterpillar 8 Bulldozer LeTourneau 4 Wheel 2 Drum LeTourneau 2 Hoist 4 Drum LeTourneau	4 Tractor Crawler 80H Diesel Caterpillar 1 Wheel 2 Drum LeTourneau	1 Tractor Crawler D2H Diesel Cat 2 Tractor Crawler D2H Diesel Cat 8 Tractor Tiral 9-1/2 Ton Gas Int 3 Bulldozer LeTourneau 1 Bulldozer Hanor 3 Wheel 2 Dr LeTourneau	- TRACTORS - 1 Crawl 4C Mod Dr CA 1 Crawl D2T Cat CA 1 Crawl 4C Cat DA 1 Crawl D2T Cat BA 8 Crawl L 4C LA 1 Crawl T10 Intar LA 2 Crawl L 4C CA 8 Crawl T20 Cat LA 1 Crawl L 4C CA 1 Crawl T10 Intar CA 1 Crawl L 4C BA 1 Crawl T20 Cat CA 8 Crawl LO 4C LA 1 Crawl D8H Cat BA 1 Crawl LO 4C CA 1 Crawl D8H Cat CA 1 Crawl LO 4C BA 3 Crawl LO 4C CA 4 Firal Euclid LA	- WELDERS - 4 Hanor LA 1 LeTourneau LA 1 Hanor CA 2 LeTourneau CA 4 Hanor BA 2 LeTourneau BA 2 Hanor DA 2 LaPlant Choate BA 1 Hagle Hoser Lef BA 1 LaPlant Choate BA - HOISTING - 2 2 Dr LeTourneau LA 2 2 Dr LeTourneau CA 2 2 Dr LeTourneau CA 2 2 Dr LeTourneau BA 2 4 Dr LeTourneau LA 1 2 Dr LeTourneau BA	2 Tractor Crawler 35 Gas Cat CA 2 Tractor Crawler D2H Diesel Cat CA - KEY TO MEN CA - KY - Fiverein Gas Area MC - Norris Gas Area WB - Wheeler Gas Area
	1 16CY Dump Intar 1 2 T Stake Chev 1 13CY Dump Mack 1 2 T Stake Ford 3 10CY Dump Hug 8 5 T Stake GMC 1 2 T Dely Intar 1 Tank Federal 1 2 T Grasso White	2 4CY Dump Federal 2 5 T Stake GMC 2 4CY Dump Federal 1 5 T Stake GMC 5 10CY Dump White 1 Tank Federal 1 16CY Dump White	2 6CY Dump Federal 2 5 T Stake GMC 1 6CY Dump GMC 1 2 T Stake Intar 1 6CY Dump White 1 Tank Federal 2 12CY Dump Hug 1 Fire Ford 3 6CY Dy Crawl Lima	- TRUCKS - 4 4CY Dump Federal LA 4 4CY Dump Crawl Lima CA 2 2 T Stake Federal BA 1 Tank Federal CA 1 2 T Help Ford BA		- KEY TO MEN CA - CB - Chickamauga Dam Area
	1 Trailer Cart 82 L Dorsey 1 Trailer Dump 20T Flat Murray 2 Major Crawler 16CY CMEI Lefl Choate 3 16CY Crawler Wagon Euclid	2 Lumber Wagon Florence 1 40 T Trailer Badgers	4 Trailer Cement Tank 6A 5bl Fruehauf 1 Trailer Dumps 12T 8bl 81A Fruehauf 1 Trailer Pole 12T 8bd 81A Fruehauf 1 Trailer Heavy Duty 40T Other Fruehauf	- TRAILERS - 1 2 Wheel Cart BA 1 20 T Tar Heating Wheel CA 1 6 T Trail Corp Amer BA 4 8CY Dump Euclid LA		4 Trailer House Lumber Florence CA
	1 16CY Dump Koppel Car 8 16CY Dump 8T Marion 9 8D T Flat Birmingham 1 12bd Flat Car Bryanside 2 6 T Tank Oil Heard		6 Car Steel Dump 15 or 20 Yd Dwigs Koppel 3 Car Concrete Skip 6CY 8bd Rlee Insley 1 Car Flat 8bd 80 Ton Koppel			
	8 Core Drill 2" Diamond Gas Sullivan 1 Core Drill 4" Calyx Rlee BH 2 Core Drill 4&6-6" Calyx Rlee ID 1 Core Drill 4&-8" Calyx Rlee ID 1 Core Drill 4&-10" Calyx Rlee ID 6 Drifter Mg 301 North 1 Hoist Mg Dr Air ID 4 Drifter Mg 371 ID 2 Hoist Mg Dr Air ID 1 Drifter Mg 179 ID 1A Jackhammer 060 ID 1 Mounting Wagon ID 1 Jackhammer 301 ID 1 Mounting Wagon North 1 Tarring Dr CY Sullivan 1 Mounting Wagon ID 1 Tarring Dr 40ad ID 2 Sharpeners ID	1 Core Drill 2" Diamond Gas Sullivan 6 Drifter Mg 371 ID 2 Hoist Mg Dr Air ID 6 Drifter Mg 301 CP 4 Hoist Mg Dr Air North 6 Mounting Wagon North 4 Hoist Mg Dr Air ID 2 Mounting Wagon ID 7 Jackhammer 060 ID 2 Mounting Wagon CP 0 Tarring Dr CP Clyde	2 Core Drill 31a 8 In 12 Gas Sullivan 2 Core Drill Calyx 6 In 8A Rlee ID 2 Core Drill Calyx 36 In 8BX Rlee ID 1 Drill Hlast Hole 9 In 8A Rlee Keystone 2 Drill Blast Hole 9 In 20T Dunprus Keys 8 Drifter 371 Air ID 32 Jackhammer 060 ID 7 Drifter 300 Air CP 2 Jackhammers 060 ID 4 Mounting 060 ID 6 Jack Mounting 060 ID 6 Mounting D ID 2 Air Breakers 2060 ID 6 Hoist ID, Air CP 6 Hoist 2C Air ID	3 Dia Core Drills 2" (12) 3-11 LA 1 Calyx Core Drill 36" (8BX) ID LA 7 Jackhammer 060 ID LA 1 Per Dr 88 Hal BA 19 Jackhammer 060 ID CA 2 Per Dr 87 Hal LA 3 Jackhammer 060 CP ID BA 1 Per Dr 87 Hal BA 11 Jackhammer 060 ID BA 2 Per Dr 87 Hal BA 2 Jackhammer 060 CP LA 1 Per Dr CCAA ID LA 7 Jackhammer 301 CP CA 2 Per Dr CP Clyde BA 11 Jackhammer 301 CP BA 1 Per Dr 8F36 Hal CA 19 Jackhammer 301 CP LA 1 Jackhammer 60 Hag LA 2 Clay Digger 1A LA 2 Jackhammer 300 1A LA 34 Jackhammer 60 CP LA	- KEY TO MEN - LA - Kentucky Dam Area CA - Chickamauga Dam Area BA - Watts Bar Dam Area DA - Hiwassee Dam Area CA - Centerville Dam Area	10 Drifters Wagon 371 Air IB PH 2 Mounting Wagon Dr Worthington PH 1 Mounting Wagon Dr CB PH 2 Hoist Wagon Dr Air IB PH 2 Jackhammer 78C IB PH 2 Paving Breakers CC60 Air IB PH 2 Jackhammer Unit Gasoline Baron CB
	1 Port 180 cfm Gas Worthington 1 Stationary 250D cfm Rlest Sullivan	1 Portable 160 cfm Gas Worthington 1 Stationary 1200 cfm Rlest Bury 1 Stationary 1255 cfm Rlest Bury	8 Compressor 160 cfm Port Gas Worthington 1 Compressor 600 cfm Stat Elec Ind Sec 1 Compressor 210 cfm Stat Worthington 2 Compressor 3000 cfm Stat Elec Sull	- GAS DRIVEN PORTABLE COMPRESSORS - 1 476 cfm Lefel CA 5 160 cfm Worth CA 1 105 cfm Lefel BA 1 160 cfm IB BA 1 120 cfm CB CA 1 160 cfm CB BA 2 180 cfm CP LA 3 160 cfm Worth BA 1 160 cfm Bury LA 1 315 cfm IB CA 1 160 cfm IB LA 2 315 cfm IB BA		
	2 Shovel 1-1/2 CY Convertible Diesel MW	2 Shovel 1-1/2 CY Convertible Diesel MW 1 Shovel 3 CY Convertible Electric Marion	1 Shovel 1-1/2 CY Convertible Gas Keystone 2 Shovel 2-1/2 CY Convertible Electric Bay	1 Shovel 1/2 CY Convertible Gas Bay City LA 1 Shovel 3/4 CY Gas Keystone CA 1 Shovel 1-1/2 CY Convertible Gas MW CA 1 Shovel 1/2 CY Convertible Gas Byers BA 1 Dragline 3/8 CY Gas Speeder LA	1 Shovel 1CY Convertible Gas Bay City BA 2 Shovel 3/4 CY Gas Bay City BA 1 Shovel 3/4 CY Gas Bay City BA 1 Shovel 1-1/2 CY Convertible Gas MW DA 1 Shovel 1-1/2 CY Convertible Gas Thew Lorain M	2 Dragline 1/2 CY Diesel Bay City CB 2 Dragline 3/8 CY Gas Bleeker ID
	1 Grader Auto Patrol 10 Gas Adams 1 Grader Leaning Wheel 12 Ft 12 Austin 1 Roller 6 Ton DW Euclid 1 10CY Carryall Scraper LeTourneau 1 Scarifier Road 3 Point LeTourneau 1 Dumper Sheepsfoot 60 In Stockade 2 Dumper Sheepsfoot 2H Euclid 2 Dumper Sheepsfoot 5H Euclid 3 Dumper Sheepsfoot DH8 LaPlant Choate	1 12CY Carryall Scraper LeTourneau 1 Grader Leaning Wheel 12 Ft 12 Adams	1 Grader Leaning Wheel 77 Caterpillar 1 Road Roller 8 Ton Gas Buffalo	1 Ditcher 6631 Gas Barber Greene BA 1 Elevating Grader 66" Austin LA 1 Elevating Grader 66" Gas Cat CA 1 10CY Carryall Scraper Gar Wood LA 4 12CY Carryall Scraper LeTourneau LA 4 12CY Carryall Scraper LeTourneau CA 1 12CY Carryall Scraper LeTourneau BA 1 Roller Road 12T Buffalo LA 1 Roller Road 12T Austin CA	- GRADERS - - SCARIFIERS - 2 Auto Patrol Cat LA 1 CBH DW LA 2 Auto Patrol Cat CA 2 1/2H Killifer CA 1 Auto Patrol Cat BA 2 Caterpillar CA 1 Auto Patrol Adams BA - SHEEPSFOOT TAMPERS - 1 Lean Whl Cat LA 2 R3050 Trojan CA 1 Lean Whl AC LA 1 R3050 Trojan BA 2 Lean Whl Cat (CA) - BACKFILL TAMPERS - 1 Lean Whl Cat (BA) T 7545 IB BA 1 Lean Whl Adams (BA)	1 Leaning Wheel Grader Austin PF 1 Backfill Tamper 8" 2560 Co PF
	1 Crawl 3/4 CY Gas 1 Drag1 3/4 CY Gar 2 Crawl 1-1/2 CY MW 2 Drag1 1CY Page 1 Clamshell 2CY Gar 1 Orangepeel 1 CY Gar	1 Crawl 3/4 CY Gas 1 Drag1 1CY P&H 1 Crawl 1CY Brown 1 Drag1 1CY BW 1 Drag1 2-1/2 CY Gas 1 Drag1 2-1/2 CY Gas	1 Power Clamshell 1-1/2 CY 721 Rlee Keen 1 Power Clamshell 3/4 CY Rlee Keen 1 Orangepeel 1 CY Hayward	1 Clamshell 3/4 CY Osgood CA 1 Clamshell 3/4 CY Osgood CA 1 Clamshell 3/4 CY Brown Hoist CA 1 Dragline 1/2 CY Osgood CA 1 Dragline 1CY P&H BA	1 Orangepeel 1CY Hayward LA 1 Orangepeel 1CY Hayward BA 1 Orangepeel 2-1/2CY Hayward CA 1 Orangepeel 4CY Hayward LA	1 Bucket 1/2 CY Dragline Gradon MP

• **FIGURE I — Part of a TVA project placement chart indicating how central control of major construction equipment can be effected in a summary form.**

types and makes and location of equipment. Backing up this data are the first essentials of any plant operations—adequate identification information. On the job such knowledge is almost a matter of daily routine. However, it is recognized that records are important in developing better practices for current and succeeding users. A vast amount of engineering and construction experience is being accumulated on every job, but all too often leaves with the persons best qualified to interpret it. This record is the property of the whole organization, and it is essential that accounting forces, estimators, designers, and executives have and use information presented in a form to show major trends and conclusions.

Identification Records

Studies made during the planning period are considered part of a particular job record. When it comes to actual requests for, say, quarry equipment, such as drills, compressors, or sharpeners, a separate requisition is issued for each item or group of like items. This establishes the first numbered record and is considered the prime working control. An operations engineer summarizes the acquisition information, and establishes a follow-up for checks as to progress of the delivery. A check sheet compiled in advance or along with the requisition shows the type and length of service, items scheduled, and progress of the specifications, award, shipment, and delivery, with a check list of file material to assure a complete handling up to the point of operation. This information is combined with other pending studies to show the status of all requisitions for that job or the related present program. Included in the working papers are the specifications for the equipment and discussions with manufacturers and the field.

A check is made for possible transfers of available or adaptable owned equipment. To date transfers of used equipment to successive jobs have aggregated over $3,000,000 second hand value. On the Kentucky Dam and Watts Bar Dam projects, equipment was transferred at a conservative depreciated value of over $800,000. This included crushing equipment, conveyors, compressors, shovels, drills, scrapers, trucks, and bulldozers, as well as marine, hoisting, cofferdam, and miscellaneous equipment.

Such continuous use necessitates a good descriptive control. Manufacturers' specification sheets, drawings, operating instructions, parts lists, photos, etc., are all kept in the central requisition file. On one job a heavy cardboard pocket-type folder was made up for each major machine and contained field copies of similar information. Upon transfer of the equipment the superintendent insisted that this folder be kept intact and go to the new location for their use. The job receiving clerk initiates an "Equipment Engineering Data" form, (Fig. II) which summarizes shipping, mechanical, production, and accounting information. As soon as the data are assembled, duplicate copies are run off for use by all job and central forces. Most superintendents and construction engineers keep a complete file of these sheets covering major items right at their elbow for quick planning or use reference. Note

that the form is designed for a complete asset ledger support, which is important to provide physical reconciliation for inventory, transfer, or sale documents.

Important sketches and notes, such as wheel load distribution, swing clearances, motor or wheel conversions, and operating rope reeving changes, are supplied as compiled. Periodic checks and review of the data upon transfer or storage keep this information up to date within working requirements. Where equipment is on rental, a temporary card summarizes description, terms, rates, and payments. A central equipment item register lists all items owned. The register is founded upon a carefully organized and maintained catalog system with a basic classification suitable for hydroelectric or other heavy construction, as shown below.

Most organizations have their own equipment numbers in addition to the manufacturer's serials. One method of numbering suggested by a scheme outlined by the U. S. Bureau of Reclamation is to let the first three digits represent the classification of the equipment-type group and the succeeding numbers show the breakdown within that group and the order of purchase. The compressor shown would thus carry owner's number 711902-5, indicating a compressed air item, portable, under 200 cfm, and the fifth item purchased of this class.

While the engineering data sheets are kept in groups by individual jobs, the register lists all like items on all jobs and includes the number, description, location, age, and approximate cost, each entered in standard columns. This allows quick takeoff by size, type, make, or fuel, and is an index to the detail requisition file. References to accounting entries, condition and attachments is also given on this 11" x 17" loose leaf register sheet. This and foregoing information are used constantly to select like equipment, apply available items, and answer all questions on the quantities and kinds of equipment owned.

Periodic reports of idle equipment are sent the central office from each job. These lists give only the name and number of the item but show the date available, the parts in stock, probable repair estimate, and the owner's recommendation for transfer, sale or trade-ins, dismantling for parts, or scrapping. Summaries of all locations are compiled and are issued to all active jobs and to early future operations, to designers, and to executive heads for possible use of owned equipment. In the central office, purchase options pending are followed up for possible purchase. By circularizing this information, special attention is called to price changes effective and of important operation characteristics observed in the recent and modern application of the equipment. If equipment is transferred, a "clearance letter" advises all concerned of the proposed movement. Upon actual shipment, the investment records are then changed to the new job.

Investment Control

An arbitrary border line is set so that, generally, items costing under $100 will not be carried in the construction equipment investment accounts. There are three main subdivisions of these accounts for each classification. "Rated" equipment includes machines upon which service, time, and repairs are kept by individual items, and are charged to their operations by a rate of time or production. "Non-rated" equipment items are those generally kept by the job on a monthly basis, such as drifter drills, hoists, buckets, pumps, and trailers. A third arrangement provides for large "assemblies" of heavy plant which combines major and minor equipment in any one installation. Examples are crusher plants, conveying assemblies, slackline cableways, and dredges.

Individual ledger sheets are kept for the rated items. The nonrated items of each classification are kept on group sheets. The assemblies cost sheets record the details of the job investment, such as clearing and grading, substructure, superstructure, installation and equipment items. Breakdown of material and labor is provided as needed by examina-

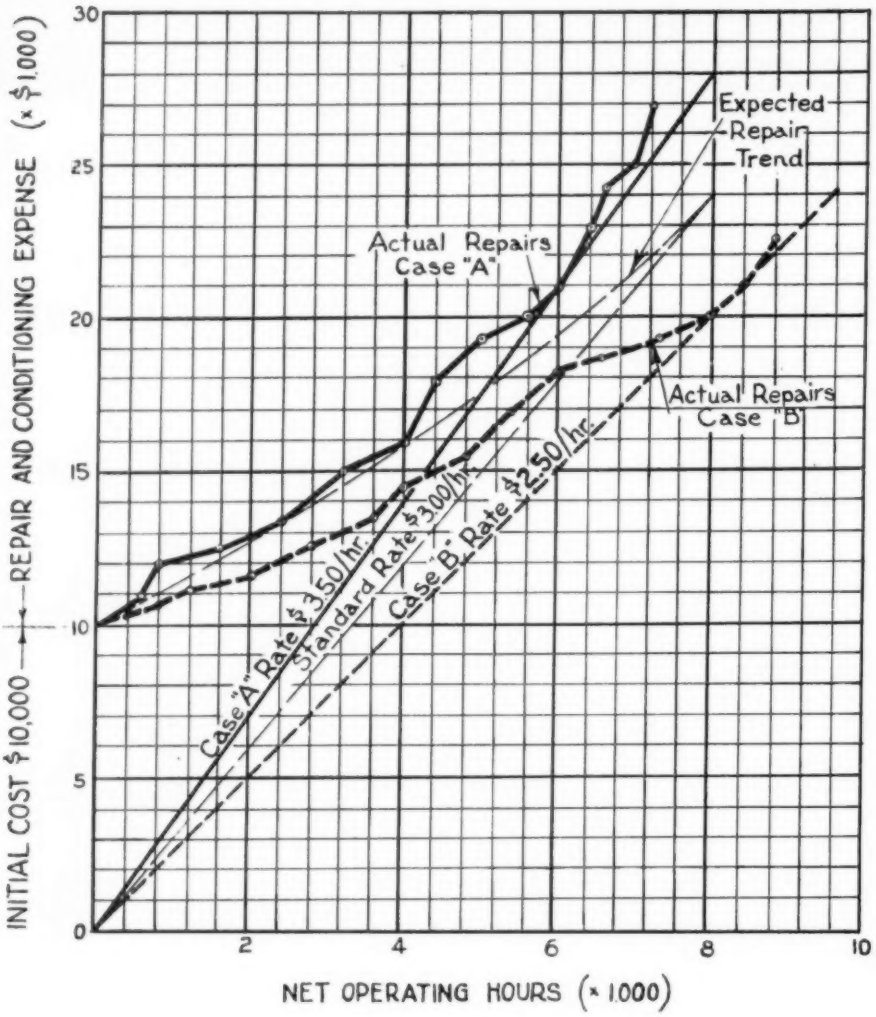
Index of Construction Plant Account Classification

Camp and Village	Construction Buildings, Shops, Utilities, and Facilities
P-100 General Site Preparation	P-300 General Site Preparation
P-101 Roads and Streets	P-301 Roads, Walks, Bridges, Drain
P-102 Telephone System	P-302 Telephone System
P-103 Fresh Water Supply System	P-303 Fresh Water Supply System
P-104	P-304 Raw Water System
P-105 Sanitary Sewer System	P-305 Sanitary Sewer System
P-106 Electrical System	P-306 Electrical System
P-107 Fire and Police Alarm System	P-307 Fire and Police Alarm System
P-108 Drainage	P-308 Compressed Air System
P-109 Landscaping	P-309 Terminal Facilities (Docks)
P-120 Cafeteria	P-310 Administration Office
P-121 Dormitories	P-311 Engineer's Office
P-122 Staff House	P-312 Time Office
P-123 Women's Dormitory	P-313 Warehouse and Storage Yards
P-124	P-314 Testing Laboratories
P-125-9 Operator's Houses	P-315 Tool Houses
P-130 Recreation and Community	P-316 First Aid Station
P-131-9 Workmen's Houses	P-317 Temporary Toilets
P-140 Hospital	P-318 Miscellaneous Small Buildings
P-141 Operators' Garages	P-319 Drill Sharpening Shop
P-142 Workmen's Garages	P-320 Machine Shop
P-143 Store—Commissary	P-321 Blacksmith Shop
P-144 School	P-322 Carpentry Shop
P-145 Town Office	P-323 Electrical Shop
P-146 Employment Office (Personnel)	P-324 Riggers Loft
P-147 Gas Station	P-325 Garage Shop
P-148 Fire and Police Station	P-326 Fire and Police Facilities
P-149	P-327
P-150 Tent Platforms	P-328
P-151 Wash Houses	P-329 Visitors' Facilities

P-700-799 Rated, Non-Rated, and Assembly Groups

70 Hauling Equipment	75 Marine Equipment
71 Air and Drilling Equipment	76 Aggregate Equipment
72 Excavation, Grading, and Surfacing Equipment	77 Cement Equipment
73 Hoisting Equipment	78 Concrete Equipment
74 Cofferdam and Unwatering Equipment	79 Miscellaneous Equipment

GEO. W.
CONDON
makes his
TWELFTH
NORTHWEST
a
Model
1 yd.
NORTH WEST
NORTHWEST
ENGINEERING CO.
750 Steger Bldg.
E. Jackson Blvd.
Chicago • Illinois
NORTHWEST
SHOVELS • CRANES • DRAGLINES • PULLSHOVELS
. . . . If it's a real Rock Shovel you won't have to worry about output in dirt!



• **FIGURE III — Operation of the repair trend curve is shown in this chart which clearly illustrates the relationship of machine repair expense and use rates.**

tion of the entries description. The physical details and inventory of the equipment investment for all accounts appear on cross-indexed copies of the equipment engineering data sheets. Periodic field reconciliations are necessary to provide physical checks of items on hand and to note the condition, value, additions, betterments, and retirements of the assets represented.

Equipment rate data and repair trend curves are compiled centrally for all major equipment. The jobs use this information to check their operating charges, to observe the rate of repair and depreciation, and to ascertain future cost of ownership. It was found that bare machine costs alone constitute a major portion of a complete job rental rate. The table at the right shows a few examples of the relative percentages of machine ownership and operation expense.

This ownership expense alone, expressed in "use-rates" of dollars per hour varies considerably according to the organization accounting methods, type of machine, and degree of service. Two groups of rates were compared as developed by one organization for various items in known service, and by a survey of many organizations in more general work. The variances shown indicated that bare machine expense was a local factor capable of interpretation chiefly by the management concerned, and that each organization must develop averages and applications of their own rates.

Excavating equipment is particularly adapted to this method of including repairs with the depreciation rate. Such machines are relatively short lived due to severe service and rapid progress in design and methods of doing work. Upkeep is high for major units. The user who has few repairs during the first part of the equipment life pays in such a "rate" an amount equivalent to the later user whose repairs are naturally higher but whose rate is the same, and whose portion of first cost writeoff is less.

The operation of the repair trend curve is shown in Fig. 3. Case "A" followed the standard expected trend for 4,000 hours, but at that point, due to machine weakness, erroneous charges, or severe service, a major overhaul

Relative Percentages of Machine and Operating Expense

Excavating and Hauling Equipment*

Equipment	Hours Recorded	Operator, Fuel, Supplies, Expense	Repairs & Depreciation (Ownership)	Complete Job Rate*
Tractor	13,422	43%	57%	$ 3.20
Tractor	7,646	54%	46%	3.20
Tractor	18,883	39%	61%	4.20
Tractor	13,855	37%	63%	4.10
Tractor	26,033	41%	59%	4.10
10-yard trac-truck	19,876	38%	62%	3.80
10-12 c. y. dump truck	36,600	40%	60%	3.20
[illegible]-ton gasoline tank truck	6,204	41%	39%	1.50
5-ton stake truck	3,002	50%	50%	3.00
3½ ton stake truck	9,933	67%	33%	1.50
3-ton stake truck	10,224	64%	36%	1.80
2-ton stake truck	3,162	63%	37%	1.70
1½ ton stake truck	11,374	71%	29%	1.30
2½ c. y. shovel-dragline	6,464	41%	59%	10.50
1¼ c. y. shovel-crane	23,075	52%	48%	7.20
½ c. y. gas dragline	13,838	64%	36%	4.70
⅜ c. y. gas shovel	1,162	51%	49%	5.10
Elevating grader	2,689	34%	66%	5.00
Ditching machine	1,022	36%	64%	5.50

*Data given and rates suggested are for one job record only. For outside rental or other general usage, consult central or specific records.

Save costly tool-changing TIME...cut accidents

Costly tool changing time is changed into productive drilling time by the modern safety-first built-in tool wrenches now available on all Bucyrus-Erie blast hole drills.

The modern built-in tool wrench and safety-first operating platform eliminates the back-breaking labor of handling heavy tool wrenches. On most jobs they cut the time for tool changing in half. They give your workmen a safe, dry platform to work on that eliminates a lot of the danger of broken legs and smashed toes. They make it easier for men to work fast.

These tool wrenches are available on all Bucyrus-Erie blast hole drills. Write for further information.

Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSIN

H 33

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

• This special air hammer head designed for driving Wakefield piling is the result of somebody's on-the-job ingenuity.

is indicated. Continued service shows progressive increases of repair expense trend which shortened the expected life of the equipment and, hence, increased its rate of writeoff. A study of job conditions advised the user what he could expect in that case. In case "B," substandard repairs were experienced throughout the machine life. The low repair increase between 6,000 and 8,000 hours was undoubtedly due to lighter service or deferred maintenance. Work can be done cheaper if machine life can be so extended as indicated by the $2.50 use rate applied for this case "B" machine. Further use of this curve will be shown under the discussion of disposal of equipment.

Equipment Operation Conditions

Perhaps the most elusive feature which concerns any equipment operation control is the service factor in terms of comparative conditions and the background of actual use to which the equipment is placed. It is the feel of the job and the little things that successful superintendents carry in their heads that do not get in the record. Behind the records discussed throughout this article there are countless stories that are of importance in operating experiences. In discussing identification, transfer, and investment problems with the field forces, operations engineers embrace a general description of the job, its major aspects, and how the equipment fits into the work in hand. The field man's particular problems sometimes lead to forgetfulness of the bigger relation to the job as a whole. In the central office one is apt to go as seriously in reverse and overlook the specific production problem and confine himself to generalities.

In observing equipment operation the standard duties are unusually well in mind. The men are trained also to observe special moves, peak loads, heavy grades or footing conditions which cannot be gathered anywhere but on the firing line. The intensity of shifts and the maximum, minimum, and average runs made are also observed. In some cases certain shifts or periods of operation or weather conditions may influence the judgment of statistical data or make results seem outstandingly good or apparently deficient. A shovel may handle 50, 100, or 200 cubic yards per hour, but the characteristics of those "yards" are mighty important to management interested in other shovel jobs and concerned in the service ability of that particular machine. The character of the material handled is observed. Its density, abrasiveness, physical and structural composition, slump, overall dimensions, shape, and weight are examples of limiting or advantageous conditions. How the equipment is loaded and how the material gets away has a large bearing on the results obtained. Auxiliary machines, and treatment of the material before and after handling, all have a bearing on the analysis of machine output.

The human element in the operation of any equipment is found to present decided differences in the production, cost and opinion of the worthiness of the machine. The distinction between assigned crews to any one machine and the productive labor to cleanup work in the pit is observed carefully. For comparable cost control some jobs assign a "standard crew" to the machine costs, the men assigned depending, of course, on the main operating functions of the equipment. Charts are made up for guidance of all concerned and show the various operator rates and probable combinations for the different machines in use.

The operators' experiences go a long way in making up one's mind as to the many practical characteristics of the equipment owned. The ease of operation, the response and accessibility of controls, the design advantages or faults for ordinary maintenance or major repair are considered in every service study. The features of safety, the type of automatic protection, the extent of delicate or cumbersome maneuvering, are further examples of the service element. Much of this data is used in the preparation of specifications and the selection of proposed new equipment. More of it concerns the actual output expectancies and delivery.

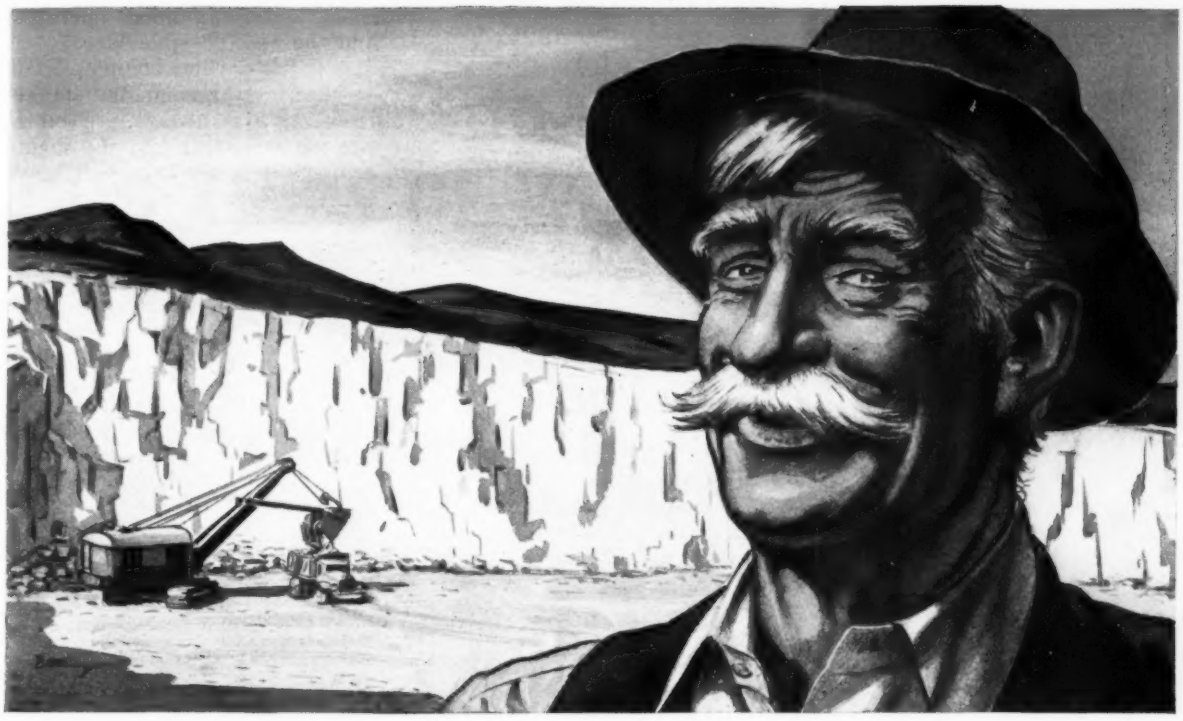
Editor's Note: TVA methods of analyzing production, maintenance, disposal, and organization and value of plant will be featured by the author in the concluding part of this article which has been scheduled for our June issue.

San Bernardino

(Continued from page 279)

bed and moved from truck to truck by the shovel, is used to screen the rough material. The county has secured good results from Bucyrus-Erie shovels, owning one 19-B and two 10-B's.

Efficiency is the keynote of Motherspaw's work. If he has to dig fines for a road mix, it isn't just random material being dug where the trucks are. He always manages to find a filled up wash or creek bed to be excavated, because the county also maintains the stream beds and banks along the highways. A small, mobile Bucyrus-Erie 10-B machine is put to work digging the material. The screen, set at a 45 degree angle, is mounted on a stable frame which will stand the shock of the batch of dirt dumped on it from a 3/8 yard heaped dipper. The fines drop on through the screen into the truck bed, leaving coarser particles free to roll off the screen to the ground. This little shovel loads out from 400 to 600 yards in 8 hours, which is plenty to keep the oil mix machine going for a day. As soon as a truck is loaded,



Joe tells why it costs less to quarry stone today

"QUARRYING SURE HAS IMPROVED. It's a good thing, too, or we'd never get out enough stone for all the new roads and the other construction for national defense.

"They tell me that powder costs alone have been cut 30% right here since the old days, and I can easily believe it. Just

take the saving on secondary shooting. What with these new powders and new ways of shooting, the rock's most all laid down ready for the shovel.

"It wasn't like that when I first came on this job. The stone wasn't broken up so nice, and it was pretty tough on those old shovels trying to load that big stuff.

"It was the Hercules people that started the ball rolling to cut down costs and boost production. They were the first ones to introduce Hercomite*—you know, the powder with lots more sticks in a case. Folks couldn't get the notion at first. But now look at it. Hercomite's used in quarries all over the country and it cuts costs nearly a third in some places.

"Of course, they've been improving Hercomite all the time; and then Hercules brought out that Gelamite* that we could use in wet holes, which saved some more money. You can use wagon drills, well drills, or coyote holes. It doesn't make any difference whether you shoot every day or only once a year, there's a way to do it with one of these Hercomites or Gelamites that will break the stuff just the way you want it.

"Yes, sir, we do a better job around a quarry now, what with the big improvement in the explosives, shovels, drills, and transportation equipment, too; and I figure a lot of the credit belongs to Hercules and the Hercules service men. They got there first with these modern high-count powders, and with all the researching and improving they're doing it looks as if they aim to stay ahead."

HERCULES POWDER COMPANY
INCORPORATED
972 KING STREET, WILMINGTON, DELAWARE
*Reg. U. S. Pat. Off., by Hercules Powder Co.

D-13

HERCULES

EXPLOSIVES AND BLASTING SUPPLIES

For your convenience in writing to Hercules Powder Company, you will find a card bound in this issue.

"It was Jackson's birthday, so we mixed a few cocktails!"

the 10-B hoists the screen up, drops it on the next truck bed, and is ready for digging again with no appreciable delay to operations owing to the switching of the screen.

Motherspaw has also rigged up a piledriver for driving rails for bank protection on the streams. He built a small set of leads, fastening the base to the bottom of a Crook Company dozer frame mounted on an Allis-Chalmers Model K tractor. A 2-ton drop hammer is operated by the cat skinner off the AC's power winch. This combination has driven as many as 160 fifteen foot rails to 8 foot penetration in 8 hours. The beauty of this setup is that it is economical, and will go into inaccessible places which would delay a regular piledriver for days.

Still another Motherspaw brainchild is a rock picker. Far out in the desert on gravel roads large rocks are always working up to the surface of the highway, menacing tires and sometimes actually causing wrecks. Hand labor to remove these stones would be too costly even if the labor was available in these remote regions. So a motor patrol is used to windrow the loose material in the center of the road. A conveyor-loader, similar to the Austin-Western companion loader of the county's Model 99 machine, picks up the windrow and drops it on a coarse screen. All the material falls through the screen back to the highway with the exception of large stones. These roll down to a conveyor belt driven by a LeRoi motor. This belt is set at right angles to the center line of the highway, and rolls the stones out to the shoulder of the road. It is simple, ingenious, and keeps the rock problem well in hand.

The main highway shop at San Bernardino houses a garage, machine shop, blacksmith and paint shop, welding shop, storage for cement, lumber and construction supplies, and also provides space to store the shovels and heavy equipment required for the construction program. This main shop is the nerve center for the county, doing all the major repairing of equipment. Smaller bases are maintained in the cities of Barstow, Needles, Victorville, Chino, Upland, Colton, Yucaipa, Bear Valley and Lake Arrowhead. One look at the well kept machinery bearing the San Bernardino County insignia represents at once a cross section of all their machinery. It is kept in tip top condition at all times.

Careful Maintenance Pays Dividends

Some idea of the dividends a program of this kind pays is shown in the county's eleven year cost report from 1929 to 1940. Skillful management has cut maintenance cost exclusive of labor and depreciation of a Bucyrus-Erie 10-B shovel, purchased new in 1937, to $7.07 per day. This shovel worked 572 days to June 30, 1940. One old Allis-Chalmers Model 35 tractor, working 1,466 days to June 30, has done so at the low cost of $4.89 per day. The lowest cost of a motor patrol was a Caterpillar Diesel No. 12, which worked 344 days for $3.93 per day for maintenance. These costs represent good operation and the best possible care.

Although this county is in southern California, the danger from snow is always present in the winter months in the mountain areas. It has been found best for the roads and best for the recreationists who travel to the winter playgrounds over these roads to keep them opened up full width during storms. A small amount of rotary equipment is kept stationed at strategic emergency locations, but most of the work is done by Walters plows and Allis-Chalmers angledozers; multipurpose machines which can be used for a variety of work in the county program. The quick moving and rapidly changing volume of winter travel keeps Motherspaw on the alert to shift his snow machines, and often it is necessary for as many as 20 pieces of snow removal equipment to be operated at once during the winter season.

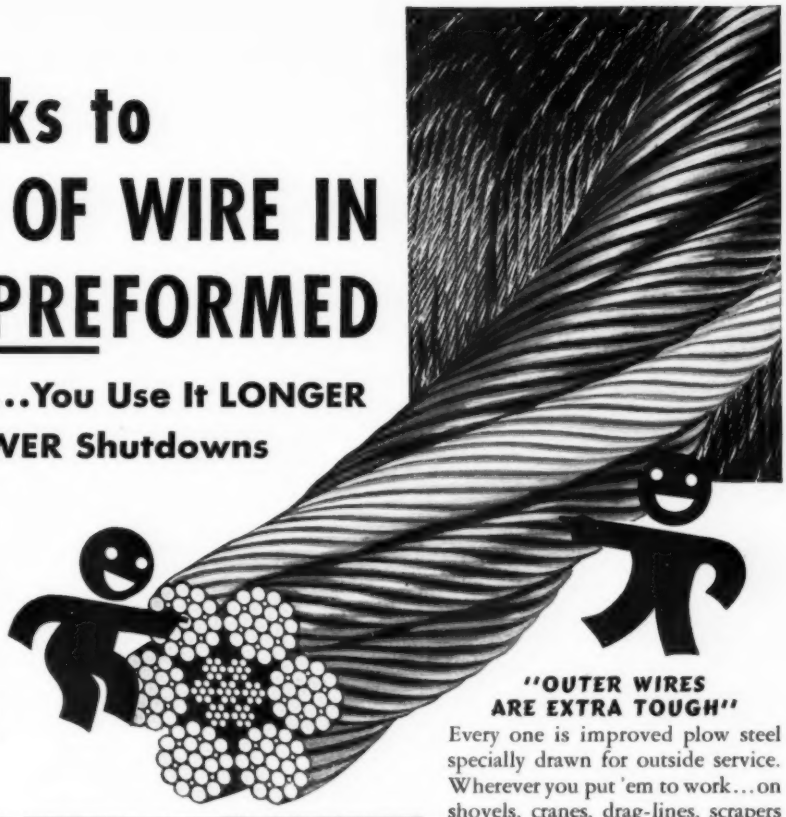
It would be a genuine pleasure for any construction man to see the attitude expressed toward his men by Assistant Commissioner Motherspaw, and conversely, to witness the admiration these men hold for their boss. Each month Motherspaw calls his boys in from every part of the county for a grand get-together. They all enjoy a show, a big feed, a general discussion, and as Motherspaw puts it, "It helps dispel the thought among these men that everybody else is no good."

The men realize that they are doing great work. They are providing safe travel for prospectors who must use miles of lonely desert roads. They are making it possible for the interstate traveller to traverse the county safely and swiftly. The intercity traveller may shuttle back and forth with ease. And the cattle barons, driving over miles of rangeland roads, are far advanced from that day not so long ago when they rode for weeks on horseback.

The San Bernardino county board of supervisors is made up of C. E. Grier, chairman, A. L. Doran, Will H. Fowler, Jess L. Stout, and Frank H. Mogle. Raymond S. Mullen is the deputy in charge of accounting.

Thanks to TWO KINDS OF WIRE IN MONARCH PREFORMED

...You Buy LESS Rope...You Use It LONGER ...You Have FEWER Shutdowns



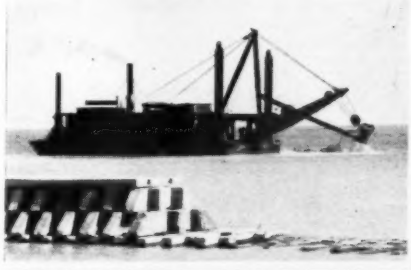
"INNER WIRES ARE EXTREMELY FLEXIBLE"

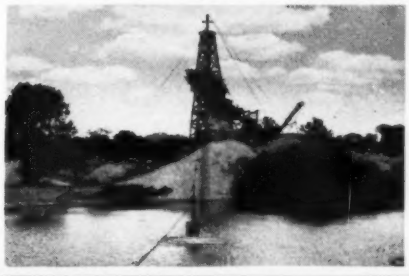
They are improved plow steel. They're drawn in a special way to make them extra strong and EXTREMELY PLIABLE. They bend over sheaves and drums easily, constantly ward off internal fatigue. These wires in Monarch Whyte Strand give the rope great reserve strength, long life.

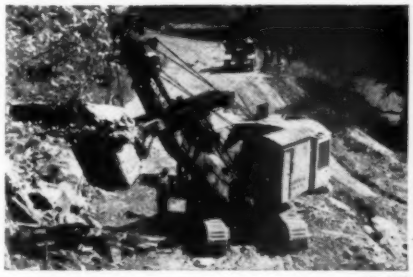
"OUTER WIRES ARE EXTRA TOUGH"

Every one is improved plow steel specially drawn for outside service. Wherever you put 'em to work...on shovels, cranes, drag-lines, scrapers ...THESE wires can take it. They're the rope's first line of defense against corrosion, abuse and abrasion. They won't give up quickly.

Then, between and around every wire, is a specially formulated Macwhyte lubricant that guards those unseen, inside wires. No bearing surface is left uncovered. All are cushioned against abrasion, friction and corrosion by the finest lubricant available. Ask your distributor about Monarch Whyte Strand PREformed.







MACWHYTE COMPANY
2903 Fourteenth Ave., Kenosha, Wisconsin

Manufacturers of rope wire—left-&-right lay braided slings — Stainless Steel wire rope — Aircraft cable, Aircraft tie rods, and "Safe-Lock" Swaged Terminals — and wire rope to meet every need.

New York • Chicago • Pittsburgh • Ft. Worth
Portland • Seattle • San Francisco
Distributors throughout the U. S. A.

MACWHYTE EXCAVATOR ROPES

TESTED INTERNALLY LUBRICATED PROVED

The correct ropes for your equipment

PRE-FORMED FOR BEST PERFORMANCE

NO. 5480

For your convenience in writing to Macwhyte Company, you will find a card bound in this issue.

Shots from the FIRING LINE

Construction Volume Largest Since '29

March construction contracts, with a dollar volume of $479,903,000 in 37 Eastern States, increased 76 per cent over March, 1940, and was the culmination of the largest first quarter since 1929, according to F. W. Dodge Corporation. In the first three months of 1941, building and engineering contracts awarded amounted to a total of $1,055,481,000 compared with $668,943,000 in the first quarter of 1940 and $1,252,330 in the first quarter of 1929.

Non-residential building showed an increase of 110 per cent over the first quarter of 1940, reaching a valuation total of $410,273,000 this year. Residential building, valued at $375,624,000 showed an increase of 37 per cent. Public works and utilities construction, amounting to $269,584,000, showed an increase of 36 per cent.

Public ownership construction continues to consist predominantly of defense projects for army, navy, and air force. Deficiencies in housing facilities for enlisted personnel and industrial workers are being met simultaneously by governmental agencies and by private builders, assisted or unassisted by government aid. In the first quarter of 1941, the fact that eighty-four per cent of residential building and fifty-nine per cent of the dollar valuation of all building and engineering contracts awarded were for private ownership indicates that private capital is flowing into construction in increased volume.

We've Just Begun!

Uncle Sam's Office of Production Management reports progress on the national defense arms program as follows:

Plants being built—1305, to cost $2,765,000,000

Shipbuilding—cargo ships alone to cost $1,750,000,000

Navy—$9,000,000,000 program for all purposes

Aircraft—production trebled in past 10 months and this must be doubled by end of year.

Ordnance — expansion of 14,400% required over average of last 20 years.

Machine guns—progress on schedule but production must increase 5 times on some types, 10 times on others by end of year.

Small arms—ahead of schedule but must be increased 100 to 500% by 1942.

Tanks—100—13-ton tanks a month now to go to 200 a month by December. Five companies now going into production of 26-ton tanks rapidly.

Powder—21 plants under construction in 11 states.

Small arms ammunition—production increased more than 1,000% in the last nine months. Plants underway for producing 22,000 rounds a day of .30 caliber and 34,000 rounds a day of .50 caliber.

Ft. Bragg Construction Operations

Fast-moving shovels, snorting tractors, and speeding trucks are putting on a blitzkrieg of their own on U. S. Army camps and airports from coast-to-coast and border to border. However, these efficient tools of the dirtmoving industry are waging a construction battle against Old Man Time as they complete job after job ahead of schedule.

Ft. Bragg, down near Fayetteville, North Carolina, is an excellent example of the speed and efficiency that marks Uncle Sam's camp building program. On June 1, 1940, less than a year ago, this Army Post was a mere village of 5,406 officers and men. With the launching of the U. S. Defense Program it was decided to change this village into a full-sized city, with facilities for housing over 67,000 officers and men.

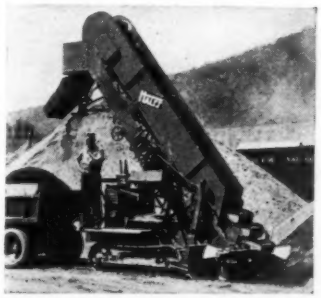
About the middle of September, 1940, the building program was started. The Constructing Quartermaster and his contractors had quite a job staring them in the face. Summarized it looked something like this: 75 miles of road, 50 miles of power lines, 50 miles of sewage lines, 40 miles of water mains, 4½ million gallon increase in daily output of water plant, 1½ million gallon increase in water storage facilities, 2,500 new buildings including barracks, mess halls, infirmaries, theaters and recreation buildings of various kinds, fire houses, etc. It was a big job, but by March 1, 1941, five and one-half months

• Top: A Bucyrus-Erie ⅜-yard dragshovel marches up a camp street at Ft. Bragg, North Carolina, excavating a water main trench. Bottom: In another part of the Fort, parade grounds receive the grading attentions of an 8-yard Bucyrus-Erie scraper powered by an International TD-18 tractor.

3 yd.-a-min. Model 75W

HIGH MOBILITY

TO MATCH HIGH CAPACITY AND DIGGING EFFICIENCY



Heavy duty Model 77C—a general service 3 yd.-a-min. creeper machine. Also with pneumatic tires.

Gravel Bank Special "80" with avalanche protection and cobble guard plates. Rated at 3 to 5 yd. in heavy duty digging.

8 yd.-a-min. "135"—the biggest, heaviest (24,400#) fastest Loader made. A money maker with a fleet of big trucks.

5 yd.-a-min. Pneumatic Tired Model 80 with Avalanche protection for use by a prominent New Jersey sand and gravel Producer.

BIG 3 and 5 yard Loaders on *pneumatic tires*, ideal for paved or hard ground. For soft-ground traction, matching machines on *creeper treads*, and a still larger 8 yd. model. . . . *Digging efficiency* via patented Haiss Feeding Propellers and slow-speed power crowding drive. . . . *Low maintenance* via alloy and manganese steel parts and loader-designed transmissions with all gears and clutches enclosed and oil-bath lubricated. . . . *Low costs* via sustained high capacity per gallon of fuel—and upkeep at ½c a yard or less. Low first cost and low depreciation. . . . SEE THE 1941 LINE.

Catalogs, prices and operating data are yours for the asking.

CLIP THE COUPON

HAISS

GEORGE HAISS MFG. CO., INC.
144th Street & Park Avenue, New York, N.Y.
Please send me complete information on ☐ 3 yd. ☐ 5 yd. ☐ 8 yd.
HAISS Loaders for _____
DUTY INTENDED
Name of Firm _____
Name of Individual _____
Street and No. _____
City and State _____

When writing to Haiss Manufacturing Co., please use coupon or card bound in this issue.

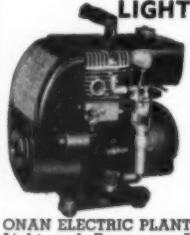
later, the program was 75% complete.

These are not flimsy tar-paper shacks, but permanent fully equipped barracks. When the project is completed there will be over 800 of these structures with interior latrines, circulating heating systems, painted exteriors, and grounds that have been neatly landscaped with trees left standing wherever possible. In one section of the Fort 109 buildings were completed in 54 working days. All Ft. Bragg roads are well graded and finished, most of them paved.

This job wasn't done with mirrors. It took planning, men, and machines. First the Fort site was cleared and graded and roads were built. Next, power lines to furnish lighting and power for the electrical equipment used in construction were installed. This made possible a communication system with 4 switchboards and 13 operators. Then water mains were laid to each camp area so that water might be available for building purposes and fire protection. After all this had been completed, the actual construction was begun. Once started, it progressed smoothly and rapidly, for with roads, power lines, communications, and water mains all set, the builders really "went to town." Beginning with an original group of 5,000 the number of workmen on the job increased steadily as time went on until it reached a peak of over 23,500 with a daily payroll in excess of $100,000.

As for machinery, there was so much of it used, and it was moved around so fast that no one ever had a chance to count it. But you can be pretty sure that just about every type of earth-mover made saw duty at some stage of the project or other. To mention only a few, there were scrapers working on the roads, drill grounds, and athletic fields; bullgraders and bulldozers land-

ONAN ELECTRIC PLANTS
for Dependable LIGHT and POWER



Alternating or Direct Current
• •
Any Voltage
Any Frequency
• •
350 to 50,000 Watts

ONAN ELECTRIC PLANTS furnish Dependable Light and Power on Excavating and Construction Jobs for the operation of all Tools used on the Job — Drills, Saws, Grinders, Sanders, Compressors, Water Pumps, Tampers in addition to Plenty of Light for Night Work. Over 40 different Models of ONAN PLANTS are in daily use in Construction and Maintenance in Commercial and Government Building during present NATIONAL DEFENSE PROGRAM.

No Job is too large or too small for an ONAN ELECTRIC PLANT. Hand Portable Models from 350 through 1250 Watts—Dolly or Trailer Models from 350 through 5,000 Watts—Stationary Units through 50,000 Watts—Air or Water Cooled—Gasoline, Natural Gas, Oil or Diesel Powered Engines.

Heavy-Duty, Compact, they're shipped COMPLETE—READY TO GO ON THE JOB.

Write Today for Complete Details

D. W. ONAN & SONS

1191 Royalston Ave., Minneapolis, Minn.

scaping, cleaning-up, and backfilling; draglines and drag shovels digging ditches for water and sewer lines; blade graders and motor patrols finishing off the roads; shovels in the borrow-pits; and dump trucks everywhere.

Comparing the new camps with the 1916-18 variety one begins to realize the important contribution modern dirt moving equipment is making towards the United States' defense program.

Prado Dam Goes to Work

By Floyd Suter Bixby

Prado Dam, second of a group of dams designed by the U. S. Engineers to provide flood protection for southern California, has recently been completed. Rising 105 feet above the level of the Santa Ana Valley floor near Corona, California, the earth fill structure will give flood protection to residents of Orange County who live in the Santa Ana Valley below the dam.

Construction of the huge barrier began in November, 1938, under a 3½ million dollar contract with Prado Constructors. This firm, composed of W. E. Callahan, the Guthrie-Marsch-Peterson Company, and J. P. Shirley pushed the job to completion on schedule.

The project involved the excavation and placing of nearly 3,000,000 cubic yards of material in the four zones of the dam. Impervious clay was used for the center core, and a mixture of random material and pulverized sandstone was used in the other zones. Caterpillar tractors, Wooldridge 25-yard scrapers, and a fleet of trucks were used to haul material to the fill.

The roller gated outlet structure for passing the normal flow is situated low on the right abutment. It is designed for 5,000 cubic feet per second. A gravity type overflow spillway is separated from the dam several hundred feet south of the left abutment, to take advantage of a natural spillway site and of a good sandstone foundation deposit found there. Concrete on the job was handled by the Pierson and Hollingsworth Company, who maintained a 300 cubic yard per day schedule to bring the job out on time.

• General view of California's Prado Dam, showing the roller gated outlet structure that is designed to pass 5,000 cubic feet per second.

Possibly the most difficult and hazardous part of the project was the excavation of a crib type cutoff wall at the lower end of the spillway. This wall, only 6 feet wide, extended 90 feet down into the sandstone. This underground excavation was done by the J. S. Barrett Company of Chicago, who used Ingersoll-Rand rock gads and air hammers to go down to full depth. The excavated rock was loaded into cars and hoisted to the top by a Northwest crane.

Cutoff walls were built of concrete, except the main cutoff under the dam. That was built with Bethlehem AP3 type steel sheet piling, keying the earth part of the dam to the sandstone underneath. The dam sets on about 50 feet of river alluvium overburden.

Rock ballast and paving was placed by the J. B. Stringfellow Company (see full length article Excavating Engineer, January, 1940). The dam had its first real test in February of this year when a lake 25 feet deep was impounded behind the mighty bulwark. Twin 66-inch bypass pipes in the outlet works then emptied the water without damage to the valley below. A statement from Lt. Col. Edwin C. Kelton, Army District Engineer, said that the dam at that time was "functioning as planned."

E. E. Ashlock was the general superintendent in charge of the work for Prado Constructors.

Contract Let to Clear Shasta Reservoir Site

A contract for clearing brush and timber from 2,150 acres of the Shasta Reservoir site on the Central Valley Project in California has been awarded to Wixson and Crowe of Shasta Dam, California, on their bid of $213,913, which was the lowest of six bids received and opened by the Bureau of

For your convenience in writing to D. W. Onan & Sons, you will find a card bound in this issue.

WELDED

ROLLED STEEL CONSTRUCTION for GREATER STRENGTH and SPEED

"WILLIAMS BUCKETS.. ARE SURE EASY ON ROPE"

... writes a veteran crane operator who has been swinging buckets for 10 years. There's a reason! Williams sheave assembly, with sheaves set askew (see illustration), keeps leads straight, reducing friction and fraying. Cable lasts longer. Sheave block is protected against contact with bucket load; open ends guard against clogging and abrasive wear.

Williams special Welded Rolled Steel Construction also increases strength and improves balance of bucket. A Williams insures faster work, cleaner dumping, more yardage, and operates for years practically free of costs for maintenance and repairs.

Prompt delivery and service through nation-wide distributors. Write for Free Bulletins *on any of the 11 types of Williams Buckets.*

THE WELLMAN ENGINEERING COMPANY
7002 CENTRAL AVENUE CLEVELAND, OHIO

WILLIAMS *Buckets*
***built by* WELLMAN**

Hercules Heavy Duty Hoists lift exactly in the center of a 10 ft. body. Hoist capacities for every load requirement.

Dump truck operators do more work with Hercules Center-Lift Hoists and Dump Bodies because:

CENTER-LIFT requires minimum lifting power.

CENTER-LIFT uses lowest oil pressure.

CENTER-LIFT with double lifting arms prevents cramping.

CENTER-LIFT eliminates strain on hinge bolts — no pushing against body hinges.

CENTER-LIFT increases the lifting capacity of the hoist.

Hercules Hoists are built for extremely fast and smooth action. No part of hoist extends below chassis frame. Investigate the time and money saving features of Hercules equipment.

HERCULES STEEL PRODUCTS CO. GALION, OHIO

For your convenience in writing to the advertisers on this page, you will find a card bound in this issue.

Reclamation at its Sacramento office. This firm is engaged in clearance work on 1,040 acres of the reservoir area under a previous contract.

Five areas on the McCloud River will be cleared under the recently awarded contract, which must be completed within 400 days after receiving notice to proceed.

Shasta Dam eventually will back up the waters of the Sacramento, Pit and McCloud Rivers to form a reservoir covering a total of 29,500 acres. Trees, stumps, and brush must be cleared from 24,000 acres above the dead storage level. Two companies of CCC enrollees from camps at Baird on the McCloud River have been assigned 8,000 acres for clearing.

California Experiments With Soil-Cement Base Highway

Soil-cement, the newest answer to the highway engineer's need for a light traffic problem solution, is being tried as a stabilizing base for a plant mix surface for the first time in the State of California on a $165,000 contract with Oswald Brothers Company of Los Angeles by the California State Highway Department.

The job involves the placement of 45,000 cubic yards of stabilized base, 26,000 tons of plant mix, 85,000 cubic yards of unclassified excavation, construction of several small structures and the placing of miscellaneous pipe drains.

• Spreader box rigged on a Caterpillar tractor, places stabilized material on Oswald Brothers' California state highway contract.

It is expected that the job will be finished some time this month.

Although some experimenting has been done in Kern County with soil-cement as a highway material and at other locations in California as a stabilizing element on plant mix shoulders, the Oswald contract at Beaumont is the first attempt to use the new material on a major road. The job is located on U. S. Highway 60, and consists of realigning, widening and separating the traffic lanes on that road.

The greatest difficulty in placing the soil-cement seemed to be in eliminating the laminations and in bonding the material together. The requirements of the California State engineers were exacting for this type of work. In the two hour allowable cycle it was necessary to mix and haul the soil stabilization material, spread it smooth (a tolerance of ¼-inch in 10 feet was allowed), compact it to 95% maximum compaction with a 12-ton roller, trim it with an Austin-Western 99 maintainer, and seal it off with a coat of RC1 rapid curing membrane sealing solution.

Because the working cycle was so brief, Superintendent H. N. Holt devised a spreader box to facilitate more even distribution of the material in front of the dozer blade by using feeder knives in the spreader box. By getting an absolutely level spread the first trip, Holt eliminated the hollows in the road which up to the time the spreader box came into use had to be patched with consequent bonding trouble. All that was necessary under the new system was a light trimming of high places. Waste was negligible. According to State Highway Engineer Hollister, an average 7 day strength of 750 pounds was secured in test cylinders of the base material.

Excavation and fill was handled by Caterpillar RD8 and D8 tractors with LeTourneau Model SU carryalls in tandem. A pusher cat was used for loading, and compaction of fills was done with sheepsfoot rollers. Holt has a good experienced excavation crew and the machines were all able to make three trips per hour hauling 35 yards per load on a 2,000 foot haul.

Mittry Brothers Win Gila Project Bid

First construction work on the distribution system for the irrigation of about 33,000 acres of rich desert land in southwestern Arizona, included in the Yuma-Mesa division of the Gila project will begin shortly, according to government reclamation officials who have announced the award of a contract for the construction of the "A" and "B" canals and laterals for the first unit to the Mittry Brothers Construction Company of Los Angeles, California. Their successful bid of $580,366.40, was the lowest of eight proposals.

The contract covers earthwork, structures and concrete lining of more than 24 miles of canals and laterals involving the excavation of approximately 800,000 cubic yards of material and the use of more than 40,000 cubic yards of concrete.

The "A" canal will begin at pumping plant No. 1 on the division's gravity main canal and extend southwest approximately 11 miles, forking in three laterals which will have a combined length of more than 3½ miles. The "B" canal will branch from the "A" canal about 2 miles from the pumping plant and extend west and south a distance of 7 miles, forking in two laterals covering a little more than 3 additional miles. Structures along the canals and laterals will include culverts, bridges, checks, siphons, flumes, turnouts and gates. The contractor must complete all the work under contract within 500 days after receiving notice to proceed.

Water will be diverted for the project at Imperial Dam, about 300 miles downstream from Boulder and 150 miles downstream from Parker. The gravity main canal, heading at the Arizona end of the dam, has been completed to pumping plant No. 1, a distance of 21 miles. Water will be lifted approximately 50 feet through pumping plant No. 1, which is now under construction,

Announcing
Simplex Heavy Duty Hydraulic Jacks

★ Pressure Tested Top Nut and Base!
★ Neoprene High Pressure Packing Seals!
★ Minimum Closed Height and Maximum Lift!
★ Each Jack is Shop Tested to 50% Overload!

We announce the addition of a new line of Heavy Duty Hydraulic Jacks to the well known line of Simplex Lever and Screw Jacks. As in all Simplex Jacks, speedy operation, ruggedness and safety are inbuilt qualities.

Send for Bulletin H.D.-41 or ask your jobber for details on Simplex Heavy Duty Hydraulic Jacks. They are stocked by leading supply houses everywhere.

Templeton, Kenly & Co., Chicago, Ill.
Better, Safer Jacks Since 1899

Simplex Jacks
dependable and efficient
Lever Type for toe and cap lifting.
Hydraulic for easier cap lifting.
Screw Jacks for economy.

For your convenience in writing to Templeton, Kenly & Co., you will find a card bound in this issue.

to the distribution system of the Yuma-Mesa area. Power for pumping will be obtained from the power plant at Parker Dam.

Almost half of the 33,000 acres included in this first section of the Yuma-Mesa division is public land and was opened for settlement upon the recent completion of the distribution system.

Montana Opens Airport Bids

U. S. Army officials are opening bids for airport improvements at the following Montana towns: Great Falls, Lewistown, Billings, and Miles City. Plans and specifications for the work on the airports were issued by the U. S. Engineer Office, Fort Peck, Montana, and bids were being received and opened in the offices of the city officials in each of the cities where the work is to be accomplished at press time.

At Great Falls the work will consist of approximately 111,800 cubic yards of excavation, providing surface treatment for approximately 115,000 square yards for landing strips, furnishing and installing 4,250 lineal feet of 24-inch drainage pipe, paving two runways with bituminous paving, and furnishing and installing electric wiring and lighting facilities.

The Lewistown airport will require about 72,500 cubic yards of excavation, sloping and leveling approximately 237,200 square yards of surface, furnishing and installing 380 lineal feet of 30-inch culvert pipe, paving two runways with bituminous paving, and furnishing and installing electric wiring and lighting facilities.

Airport improvement at Billings will include approximately 175,000 cubic yards of excavation, construction of about 155,000 cubic yards of stabilized base, paving two runways with bituminous wearing course, furnishing and installing 270 lineal feet of 12-inch culvert pipe, and furnishing and installing electric wiring and lighting facilities.

At Miles City the airport construction will involve approximately 35,000 cubic yards of excavation and will include all work necessary to grade, furnish, and install approximately 10,000 lineal feet of drainage pipe, 42 drainage structures, and pave one runway with bituminous paving. The contract will call for fencing the entire field and furnishing and installing electric wiring and lighting facilities.

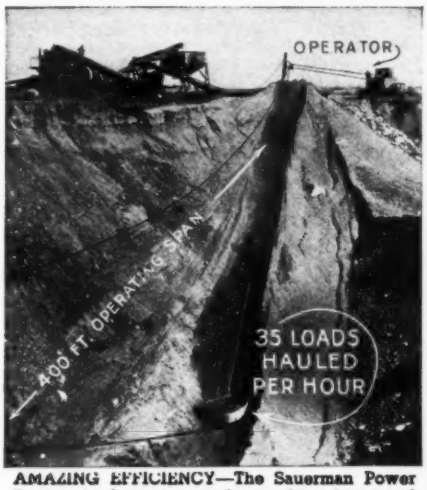
New York Safety Convention

Safety engineering techniques imported from the European war zone for adaptation to the American national defense program headlined many of the engineering and construction sessions at the Twelfth Annual Safety Convention and Exposition in New York's Hotel Pennsylvania, held April 22-25. The convention, sponsored by the Greater New York Safety Council, was keynoted by the central theme "Safety-Defense-Liberty."

Opening with a discussion of military suggestions for defense of our cities in the event of attack by land, air or sea,

SAUERMAN LONG RANGE MACHINES

DIG, HAUL & DUMP FOR A FEW CENTS PER YARD



AMAZING EFFICIENCY—The Sauerman Power Scraper is the most popular machine for gravel excavation and general dirtmoving. The above picture shows why. Note the simplicity of the operation. One man does everything. Fifty cents an hour covers the fuel cost. The streamlined Crescent bucket digs a heaping load quickly in any class of material and hauls the load at high speed with a minimum of friction.

Use a Sauerman machine to reduce your equipment cost and operating expense on such work as the following:

—making long cuts and fills
—canal and levee construction
—cleaning reservoirs
—digging gravel from rivers, hills and pits
—stockpiling and reclaiming gravel, coal, ore, etc.
—and other long haul work.

A Sauerman machine has a great advantage over other types of equipment on work such as listed above because it is able to reach any distance up to 1,500 ft. and dig, haul and place the materials in one operation. For a complete explanation of the savings you can make by using Sauerman machines, write for our catalog.

SAUERMAN BROS., Inc.
474 S. Clinton St., Chicago

More Payloads per truck
More Profits per job

with the Brooks LOAD LUGGER for Excavating Road Building Quarry Work Construction
wherever loading is done by hand!

This is a typical Load Lugger job . . . and one of the many operations where work can be speeded up and costs reduced by using the Brooks system. The loaded buckets are picked up, hauled away and dumped, while the men are filling empties. Equip your trucks with Load Luggers and increase their efficiency. Ask for descriptive Catalog No. 44.

Write for details of our Special Introductory Offer of a Two Weeks' trial of the Load Lugger.

305 Davenport Road

Brooks EQUIPMENT AND MFG. CO.
Distributors in all Principal Cities
KNOXVILLE · TENNESSEE

For your convenience in writing to the advertisers on this page, you will find a card bound in this issue.

Col. J. A. Baer, chief of Staff, Second Corps Area, spoke on "Metropolitan Defense." Reassuring to those who may have feared laxity in preparing our urban defenses, the discussion revealed the extent to which military experts are prepared to adopt European defense techniques, revised to meet our own local conditions.

Safety-defense aspects of traffic control, the place of the commercial vehicle in national defense and streamlining our existing highways in anticipation of the heavy demands of our national defense program were analyzed in several engineering sessions at the convention. Engineering aspects of industrial health and accident prevention programs were considered in other sessions.

A panel discussion of management incentives for accident prevention in the construction industry, was presided over by W. J. Barney, president, Metropolitan Builders Association, New York Chapter, Association of General Contractors. Discussion topics for the panel included compensation insurance rates, industrial codes, code enforcement, industrial relations, job cost reduction and foremen training. Those participating in the panel were: Henry D. Sayer, Compensation Insurance Rating Board; W. J. Picard, Board of Standard and Appeals; M. J. Murphy, deputy industrial commissioner, Department of Labor; R. W. Kemp, the Dravo Corporation; W. K. Shaw, Turner Construction Company; and A. B. Fleck, American Mutual Liability Insurance Company.

Another panel discussion considered fundamental causes of accidents and was composed of a board of four independent safety experts and four plant safety engineers. The discussion was planned to bring out the psychological and theoretical causes of accidental injuries as well as the practical application of safety engineering principles in accident reduction.

Other engineering phases of safety and defense to be considered were:

"On Guard" a session paralleling the activities of the Committee for Conservation of Man Power in National Defense Industries, which will study "Guard" devices for machinery and equipment in industrial plants. George M. McAinsh, Engineering Department, American Mutual Liability Insurance Company, presided.

"Training Green Hands" and examination of aptitude tests, safety training and accident prevention among new employees in the plant and the office. Speakers included Robert R. Tufts, Human Engineering Laboratory, Stevens Institute of Technology; R. S. Elberty, Engineering and Safety Division, Fireman's Fund Indemnity Company, New York.

"Outside Plant Lighting for Defense"—planning of outside plant lighting as a protection against sabotage attempts, by Hoyt Post Steele, Benjamin Electric Manufacturing Company, Des Plaines, Illinois.

"Rock Drill Dust Control"—methods and costs of dust control and their relation to safety, by F. G. Amey, Brewster Aeronautical Corporation, New York.

"Safety in Tunneling the Delaware Aqueduct"—hazards of gases, fumes, fog and mists, were encountered, studied and overcome. Presented by Wm. B. Harris and Dr. Leonard Greenburg, of New York State's Department of Labor.

In all there were 52 sessions during the four-day affair, 200 speakers were on the program and more than 100 manufacturers displayed their equipment.

Grand Coulee Highway Relocation Bid Awarded

Additional highway relocation work will soon be underway to skirt the rising reservoir in back of Grand Coulee Dam, Bureau of Reclamation officials have announced in awarding a contract for the relocation of an 18-mile section of Ferry County road in Washington.

Successful bid for the work was submitted by the Erickson Paving Company of Seattle, Washington, on its bid of $153,094.27, which was the lowest of five proposals received and opened by the Bureau of Reclamation at its Denver, Colorado, office.

The relocated road will extend from

THEN WE PUT ON
GATKE FRICTIONS
He came in walking on air. Shoved a Progress Report under my nose and crowed, "We're going places now! You remember how the Swing Frictions had been holding us up?
"Then we put on GATKE Frictions. What a difference! Say, they have power to spare —swing any kind of load with an easy touch of the lever. We're moving a third more dirt on every shift. Looks like they'll last forever — They show no sign of wear."

For 27 years GATKE has specialized in developing Frictions, Brake Lining, and Clutch Facings to lick tough jobs.

Whatever your service, GATKE has what it takes to do the job better and last longer.

Just tell us what you need—You'll get it.

GATKE CORPORATION

232 N. La Salle St. Chicago, Ill.

For your convenience in writing to Gatke Corporation, Inc., you will find a card bound in this issue.

Mink Creek to Barnaby Creek and from Barnaby Creek to Stranger Creek near Inchelium. The contract involves earthwork, surfacing of the road, and building structures and right-of-way fences. The structural-steel span of Colville River bridge now in position near Kettle Falls, Washington, will be removed by the contractor and re-erected in the Hall Creek bridge. All work is required to be completed within 180 days.

The reservoir, which will soon reach its full size, 375 feet deep and 151 miles long, will bury existing highways as well as two branches of the Great Northern Railway.

Approximately 180 miles of state highway and secondary roads and 29 miles of railroad are being relocated around the reservoir. Three major bridges, six smaller bridges and numerous other structures, such as underpasses, overpasses and culverts, are being built.

Commissioner States U. S. Power and Irrigation Plans

A recent speech "Hydro-power and Irrigation" by John C. Page, commissioner, Bureau of Reclamation contains an interesting account of the government's activities and future plans regarding national power and irrigation projects.

The major portion of the Commissioner Page's address delivered before the 19th Annual Convention of the Izaak Walton League of America, Inc., at Washington, D. C. on March 28 follows:

"The generation of hydroelectric energy and the irrigation of arid land have proven themselves natural working partners in the development of our western resources. Nearly 39 years of experience in constructing irrigation systems in the West have demonstrated to the Bureau of Reclamation that power and irrigation freqently form the most efficient combination possible in this work. On every irrigation project where they have been combined they have supplemented each other in attaining the ultimate objective of the reclamation law under which the Bureau of Reclamation operates.

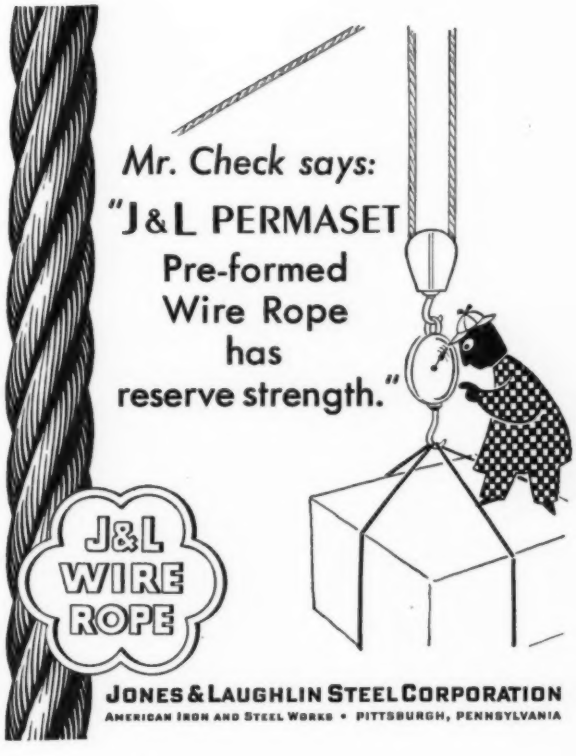
"The ultimate objective of the reclamation law is the creation of new homes and opportunities for a westward-pushing American population through the construction of irrigation works to make available a supply of water to fertile but arid lands in 17 western states. Operations under the law have been highly satisfactory. Nearly a million people on 40 reclamation projects can thank this law for their homes and livelihood. About one-quarter of them cultivate irrigated farms which produce a hundred million dollars' worth of crops annually. These crops consist mainly of forage to feed livestock, the major industry in the West. Other main crops are vegetables, fruits and specialties. The remainder of the project people live in the 258 cities and towns which have sprung up or expanded in the wake of project development. They work in stores and other business activities of the towns, and in the hotels, the feedmills, and the factories.

"These million persons provide an annual market for more than two hundred million dollars' worth of manufactured articles and processed goods. This purchasing power forms a stable backlog of business for American industry greater in value in normal times than any foreign market except the United Kingdom, Canada, Japan, and France.

"The taxable property created or protected by these 40 reclamation projects is valued at more than 4½ billion dollars.

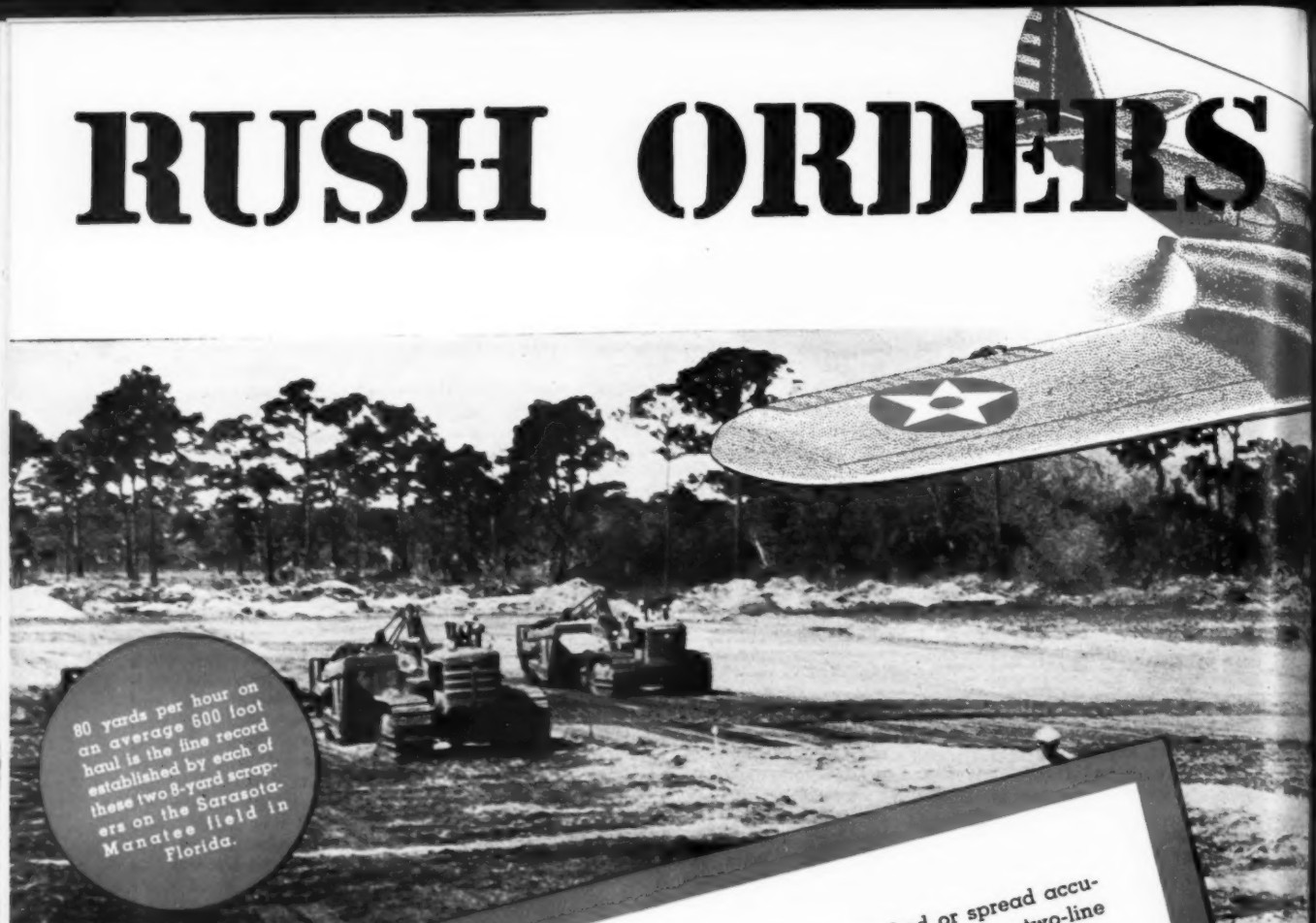
"This entire beneficial investment with its consequent profit to the rest of the nation, owes its creation to this twin combination of land development and power development. In the first place, energy was required originally for the physical construction work necessary to build the irrigation projects, such as the erection of dams and the excavation of canals. Hydro-power, provided this necessary energy. Second, on many projects energy was required for pumping water to arid land higher in elevation than the reservoir or stream from which it was drawn. Here again, hydro-plants produced the necessary power. And last, hydro-power has helped irrigation projects meet their

HAYWARD
PLAY SAFE . . .
CHOOSE HAYWARDS
Hayward Buckets won't fall down on the job, cause time out, or require costly repairs.
THE HAYWARD COMPANY
52-54 Church Street
New York, N. Y.
BUCKETS


Mr. Check says:
"J&L PERMASET Pre-formed Wire Rope has reserve strength."
J&L WIRE ROPE
JONES & LAUGHLIN STEEL CORPORATION
AMERICAN IRON AND STEEL WORKS • PITTSBURGH, PENNSYLVANIA

For your convenience in writing to the advertisers on this page, you will find a card bound in this issue.

RUSH ORDERS



80 yards per hour on an average 600 foot haul is the fine record established by each of these two 8-yard scrapers on the Sarasota-Manatee field in Florida.

Rush orders for airports are coming your way and it will pay you to investigate now the outstanding performance Bucyrus-Erie tractor equipment has proved on airport construction in all parts of the country. A few of these operations are illustrated here, and there are many others where fleets of Bucyrus-Erie have demonstrated their ability to out-perform anything in their class. Measured on the basis of output capacity, economy, convenience, accuracy of grading, or trouble-free operation, you will find only one answer by the men who have used them and that is "Bucyrus-Erie *first* . . . by a wide margin."

Bucyrus-Erie scrapers load easily with a fast flowing boiling action. They handle any type of material with uniform big pay loads. The positive rolling ejection cleans the bowl fast. The dump can be bunched or spread accurately with the smooth operating two-line control.

Bucyrus-Erie bullgraders and bulldozers dig fast and carry heavy loads easily because of the engineered curve of the blades that gives free non-fouling rolling action. You get extra horsepower for digging because of the balance that keeps the crawler tracks driving with "all four feet" on the ground. The efficient dependable control system provides accurate grading and dependable low maintenance operation.

In addition to a complete line of 4-wheel and 2-wheel scrapers, bulldozers, and bullgraders, Bucyrus-Erie also offers rippers, tamping rollers, and grubbers to speed up airport work. Bucyrus-Erie Company, South Milwaukee, Wisconsin, U. S. A.

• SEE YOUN

TRACTRACTO)

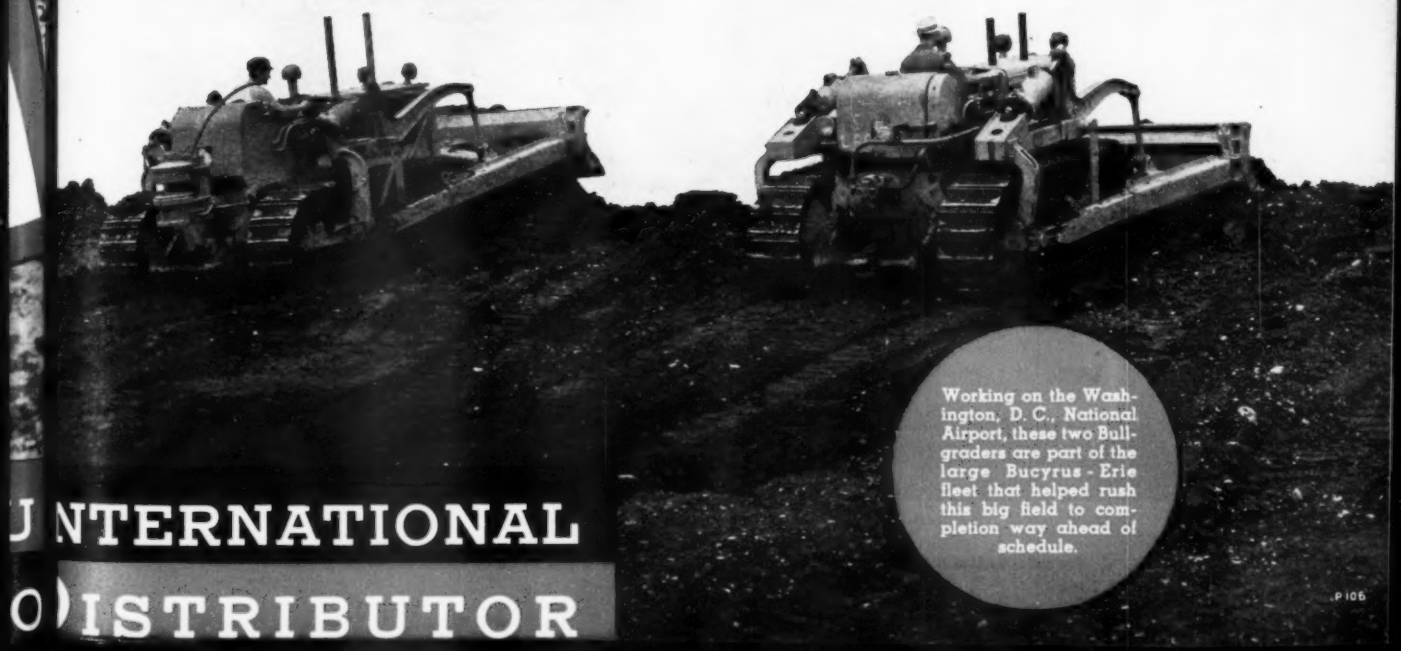
FOR AIRPORTS

…s is one of three 8-yard scrapers that …rted on the Melbourne-EauGalie, Florida …port last November. Since finishing there, …y have also been used on the DeLand …d Ocala airfields.

Averaging 64 yards of white loam per hour, this 6-yard scraper was one of the big reasons that Bloomington, Indiana got its airport done in such fast time.

Moving 1000 yards per 8-hour day on passes averaging 300 feet, this TD-18 Bullgrader was a mighty handy unit on Morrison Field, West Palm Beach, Florida. It also back-filled trenches and fine-graded runways.

BUCYRUS ERIE



Working on the Washington, D. C., National Airport, these two Bullgraders are part of the large Bucyrus-Erie fleet that helped rush this big field to completion way ahead of schedule.

P-105

…NTERNATIONAL

…ISTRIBUTOR

cost of irrigation construction, which must be repaid by the recipients of the water. As a matter of fact, in a number of instances hydro-power made the construction of the project possible, for without the anticipated additional income from power revenues the project could not have been found economically feasible. A finding of economic feasibility is a requirement of the reclamation law before project construction may be started.

"An example of this dependence on hydroelectric power is the Boulder Canyon Project in Arizona-Nevada. Power revenues will pay the greatest share of the cost of construction of this great multipurpose project, so vital to the welfare of the Southwest.

"Naturally, playing this large and helpful role in the permanent settlement and development of the West, hydroelectric capacity on reclamation projects has shown tremendous increase. The first small beginning was a power plant with a capacity equivalent to 975 kilowatts, built in 1906 on the Salt River Valley Reclamation Project in Arizona. This small power development has been multiplied nearly a thousandfold. Today the 24 power plants operating on reclamation projects have an installed capacity of 873,655 kilowatts, and an ultimate capacity much greater. When power plants now building and others planned for construction are completed, the total power available on reclamation projects will attain the impressive figure of 4½ million kilowatts—practically equaling the entire present hydro development in the western half of the United States.

"The increased use of hydroelectric energy in the expansion of the West, and the interdependence of hydropower and the irrigation of arid lands, are therefore obvious. In the work of the Bureau of Reclamation they can be said to be mated for life. Although irrigation of waste desert land and protection of closely settled irrigated areas are primary in the water conservation of the bureau, the generation of electric energy is indivisibly the chief by-product. Irrigation and power generation in the West complement each other."

Charles B. Owen

Charles B. Owen, vice president of the Colorado Association of Highway Contractors was killed in an airplane accident, near Hanna, Wyoming, April 14, 1941. Also killed in the accident was Stanley Jamellier, 30, commercial airplane pilot, whom Mr. Owen engaged for the trip.

At the time of his death, Mr. Owen was returning from a flying inspection trip which he had made to an active highway contract at Pinedale, Wyoming. Flying in a blinding snow storm, the plane crashed into the side of a mountain shrouded in fog. After crashing, the ship burned. Missing for 24 hours, the airplane was found after an all-day search participated in by many aviators. The bodies were burned beyond recognition.

Charles Owen, who was 48, was born near Norfolk, in Stanton County, Nebraska, July 3, 1892. He was the son of Henry E. Owen, pioneer railroad and irrigation contractor who operated in Colorado and Wyoming. As a young man, Mr. Owen spent most of his time around the construction operations of his father.

Shortly after 1920, he entered the contracting business on his own and did much construction work in connection with the oil boom in the vicinity of Ft. Collins, Colorado. Thereafter, for a number of years he confined his operations to railroad and irrigation work.

In the late 20's he became actively engaged in the construction of highways and during the past fifteen years constructed many of the important highway projects in Colorado and Wyoming. He was the contractor on the recently constructed 4-lane divided highway from Denver, extending through Littleton.

He has recently been engaged in the construction of a 7-mile, $66,000 surfacing project between Granada and Holly, Colorado, 25% complete; a 20-mile $140,000 surfacing project near Big Piney, Wyoming, 40% complete. He also was recently awarded a contract for the construction of a 10-mile $150,000 surfacing project between Meeker and Rifle in Colorado, on which no construction has been undertaken.

Mr. Owen was married to Iona M. Friday, daughter of Charles Friday of Laramie, Wyoming, who survives him.

Gavin William Hamilton

Gavin William Hamilton, 65, of 380 Marion Street, Denver, Colorado, known throughout the West for his contracting accomplishments, died at Porter Sanitarium, where he had been confined for an extended illness. Uremic poisoning was given as the immediate cause of his death, which occurred April 17, 1941.

Mr. Hamilton was born in Glasgow, Scotland, August 6, 1875. He came to America in 1893 and soon thereafter settled in Pueblo, Colorado, where he secured employment with the Denver and Rio Grande Western Railroad. He was married to Mollie Gleason of Pueblo, Colorado, on June 12, 1902.

In 1905, with his brother-in-law, R. J. Gleason, he entered the contracting business and for many years executed large railroad contracts in Colorado, Wyoming, Montana, Arizona, and California.

During the World War, he volunteered and served as a First Lieutenant with the 22nd Corps of Engineers.

At the time of his death, Mr. Hamilton was president of the contracting firm of Hamilton & Gleason Company, Denver, which he organized in 1922. This firm constructed many railroad, tunnel and highway projects in the West. Among these were a 110-mile railroad from Childress to Pampas, Texas—a Colorado River Project Tunnel for the Metropolitan Water District of Los Angeles—and many highway jobs in Colorado, Wyoming, and New Mexico.

He is survived by his widow, Mollie G. Hamilton, two brothers—Robert M., of Denver, Charles S., of Colorado Springs, and three sisters—Mrs. Ed. Honnen, Colorado Springs, Mrs. Paul R. Lenz, Novo, Ohio, and Mrs. William Moore, who resides in Ireland.

WHAT DO YOU WANT
IN A TRAILER?
headroom clearance
road clearance
OR-traffic clearance
ROGERS builds trailers of every type of a design that has been thoroughly proved under every conceivable condition of difficult service.
Scientific design, based upon long experience, alloy steel and electric welding produce trailers that have an envious record for long service with remarkable freedom from repairs. Get the NEW catalog.
ROGERS
ROGERS BROS. CORP.
136 ORCHARD ST. ALBION PENNA
EXPERIENCE builds'em PERFORMANCE sells'em

For your convenience in writing to Rogers Brothers Corporation, you will find a card bound in this issue.

Florida Farm Hands

(Continued from page 275)

not only on Stein's farm but also on those of many of his neighbors. But as time went on, more and more land was recaptured from the saw grass, and the district grew. Soon, there was too much work for one machine, and so, a little over a year ago, Fritz Stein bought another one. Now he rents both machines out wherever they are needed.

When they are not busy elsewhere, he uses them on his own farms. Between his own farms and his neighbors', the two 10-B's are kept busy all of the time.

A great deal of Mr. Stein's success has been due to his ingenuity in adapting these machines for work in the everglades muck. This muck is very soft and rather light. Roads built on top of it will vibrate as heavy trucks pass by. The draglines are often called upon to work on the bottom of the canals where, in spite of gates and pumping, the water comes in clear over the tops of the cats and sometimes clear up to the deck of the cab itself. Such going is much too soft for even a light 10-B with its mere 8 tons or so of weight and wide 20-inch treads. Stein solved the problem by bolting onto the steel treads wide wooden shoes to increase the bearing area. These jumbo treads measure 32 inches in width and 7 inches in length by 2⅝ inches in thickness. They are made of local pine and keep the machines on top of the muck and enable them to work in a lot of places that otherwise couldn't even be touched.

Since the muck is also a lighter material than most, Fritz Stein decided that the machine should be able to produce more in muck than in ordinary material and so, on his first machine, he took the ⅜-yard Red Arch type "U" dragline bucket, cut it in half and then welded in an 8 inch strip increasing capacity of the bucket to about ½-yard. When he bought his second machine, he had a special ½-yard bucket made out of Corten steel. The use of this lighter steel gave him a ½-yard bucket weighing only 665 pounds.

In lieu of extra counterweight he added rear end weight to the 10-B by mounting a 1500 watt Kohler electric plant at the back of the machine to give him light for working at night. In order to protect this plant from weather, he took off the rear of the cab, added 24 inches to the top and sides and then put the rear end frame and doors back on again. This extended the cab out over the counterweight and gave him plenty of room for his light plant. He uses this same machine, from time to time, as a clamshell and has, therefore, equipped it with a Huddomatic tagline.

The operator of machine number 2 has rigged up a very ingenious "contraption" for oiling the swing circle. He has placed a quart cylinder on the operator's side of the frame, holding the

Drilling and Fishing Tools

By

BUCYRUS ERIE

Your drill is no better than its weakest part. For the best results you need time tested, dependable tools that ask no favors; tools that are designed to do a job effectively and made of steels that give long service. Bucyrus-Erie tools have proved through years of service that they meet these requirements. Send for Tool Catalog and Price List today. And the next time you need drilling and fishing tools — try Bucyrus-Erie Service. Stocks are kept at convenient warehouses in South Milwaukee, Wis.; Evansville, Ind.; Englewood, N. J.; and Waterloo, Iowa, for your convenience.

BUCYRUS-ERIE

SOUTH MILWAUKEE, WISCONSIN, U.S.A.

Excavating, Drilling, and Material Handling Equipment

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

hoist drum. From this cylinder a pipe runs down through the floor to the swing circle. A petcock has been inserted where the pipe connects the cylinder so that all the operator has to do to oil his swing circle is turn on the petcock and swing his machine around.

Machine number 1 is equipped with a Hercules gas engine and machine number 2 has a Buda gas engine. Sinclair gas, oil and grease is used exclusively. Both 10-B's are equipped with Leschen wire rope.

To effectively slope the walls of the lateral ditches, steel wings have been welded to the sides of the bucket so that the laterals will be left with clean smooth walls.

Maintaining the Canals

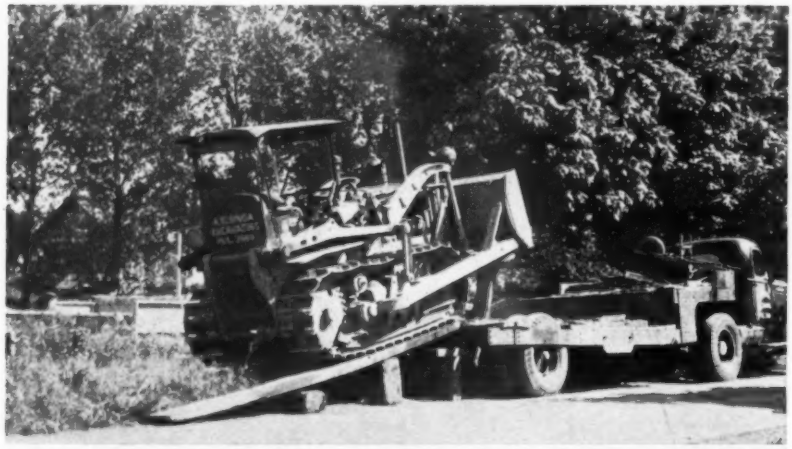
Of course, the drainage canals have to be cleaned out about once every year. But about the only growth that has to come out of them is hyacinths. For work of this nature, Mr. Stein uses a wide shallow bucket made of round steel bars. It looks like a large wire basket with one side of it taken off and dragline bails hitched to it. This weed bucket pulls easily through the water and muck and brings up only the hyacinths and their roots. It is about 5 feet wide, 24 inches in depth and 18 inches in height.

Frequently, Stein is called on to build small levees alongside of canals to keep the water from overflowing onto the fields. Here too, he uses the hyacinth bucket, placing a steel plate on the bottom and short plates on the back and sides. Thus, he can borrow muck from the bottom of the canal, but the water drains out easily over the sides of the short metal plates.

The machines dig on an average of about 1,400 feet of wet lateral in 9 hours, running about 15 cubic feet of material to a running foot of ditch. This makes an average production of about 800 cubic yards of material per nine hours. Harry Schug, operator, says that in dry ditch he usually averages about the same amount of material, but has on several occasions, gotten over a thousand yards in nine hours.

Rock encountered at the bottom of the main canals is always saleable for road material. On one occasion where rock was needed for the road along the canal and could be cast into place, Mr. Stein took one of his 10-B's to one of the canals and dug through 3½ to 5 feet of muck down to rock, removing 5 to 6 feet of rock from the canal bottom at a total cost of about 25c per cubic yard of rock.

The next time you enjoy green vegetables in the middle of winter give a silent vote of thanks to men like Fritz Stein who are transforming the waste lands around Lake Okeechobee into a veritable salad bowl to provide the rest of America with fresh, health-giving vegetables the year 'round.



• **Top: Its work completed, this International - powered Bucyrus-Erie 'dozer mounts a platform trailer that will speed it to the next job. Bottom: Contractor Elsinga uses this ⅜-yard Bucyrus-Erie shovel for excavations where material must be hauled from the site and to load fill.**

Bulldozer Built Basements

(Continued from page 272)

they have all their basements dug by Elsinga, with payment on a regular monthly basis. This, with individual "orders" keeps the Elsinga equipment stepping right along. A total of 11 or 12 basements is not unusual for the three bulldozers. As many as five have been dug in a single day by the TD-14—a tribute to both the operating and organizing ability of Contractor Elsinga.

Where to Buy BUCYRUS ERIE and BUCYRUS MONIGHAN Products

For Shovels, Draglines, Cranes, Clamshells, Skimmers, and Dragshovels 'Phone or Write the Nearest Dealer or Branch Office Listed Below.

For Large Shovels and Draglines, Walking Draglines, Bucyrus-Ruth Excavators, Blast-Hole, Prospecting, Oil Well, and Water Well Drills, 'Phone or Write the Nearest Bucyrus-Erie Branch Office Indicated Below with an *

ALASKA: (See Washington, Seattle).

ARIZONA, PHOENIX: O. S. Stapley Co.

ARKANSAS, LITTLE ROCK: Lyons Machinery Company.

CALIFORNIA, LOS ANGELES: Crook Company, 2900 Santa Fe Avenue, Phone Kimball 5137.
*SAN FRANCISCO: Bucyrus-Erie Company, 390 Bayshore Blvd. Phone Atwater 2341.

COLORADO, DENVER: Ray Corson Machinery Co., 1646 Wazee Street.

CONNECTICUT, NEW HAVEN: The W. I. Clark Co., 1811 Dixwell Ave.

FLORIDA, JACKSONVILLE: Quinn B. Barton, Inc., 1305 W. Forsyth St.

*GEORGIA, ATLANTA: Bucyrus-Erie Co., 1508 William-Oliver Bldg. Phone Jackson 1545.
ATLANTA: R. S. Armstrong & Bro. Co., 676 Marietta. Phone Jackson 2010.

IDAHO, BOISE: The Intermountain Equipment Co., Broadway at Myrtle St. Phone 171.

*ILLINOIS, CHICAGO: Bucyrus-Erie Company, 1312 Bankers Bldg., 105 W. Adams Street. Phone Franklin 5321.
CHICAGO: Great Lakes Supply Corp., 824 W. 36th St.

INDIANA, INDIANAPOLIS: A. F. Deaney, 719-721 N. Pine St.

IOWA, CEDAR RAPIDS: James W. Bell, 916—16th N. E.
DAVENPORT: Harry Alter & Sons, 514 S. Howell St.

KANSAS, PITTSBURG: Bucyrus-Erie Co., 209 East 4th St. Phone 164.

KENTUCKY, LOUISVILLE: Brandeis Machinery & Supply Co., Brook & Warnock Sts. Phone Magnolia 6600.

LOUISIANA, NEW ORLEANS: Wm. F. Surgi, 101 Magazine St.

MAINE, PORTLAND: Maine Truck-Tractor Co., 158 Veranda St.

MARYLAND, BALTIMORE: Stuart M. Christhilf & Co., 205 Snow Bldg. Phone Calvert 4310.

*MASSACHUSETTS, BOSTON: Bucyrus-Erie Company, 240 N. Beacon St. Phone Stadium 3152.

MICHIGAN, DETROIT: E. D. Coogan, 10410 E. Jefferson Ave.

MINNESOTA, CROOKSTON: Wm. H. Ziegler Co., Inc., 1115 So. Main St.
DULUTH: Wm. H. Ziegler Co., Inc., 304 Lake Ave., So. Phone Melrose 681.
MINNEAPOLIS: Wm. H. Ziegler Co., Inc., 2331 University Ave., S. E. Phone Gladstone 7971.

MISSISSIPPI, JACKSON: Mississippi Road Supply Co., Telephones: Long Distance 9906. Local 3676.

*MISSOURI, KANSAS CITY: Bucyrus-Erie Company, 1007 Fairfax Bldg. Phone Harrison 4811.
*ST. LOUIS: Bucyrus-Erie Company, 818 Olive St.—Suite 906. Telephone Chestnut 1354.
ST. LOUIS: Ryan Equipment Corp., 1519 N. Broadway.

MONTANA, BILLINGS: J. D. Adams Co., 2313 First North.
MISSOULA: Westmont Tractor & Equip. Co.

NEBRASKA, OMAHA: Cardinal Supply & Mfg. Co., Sunderland Bldg.
OMAHA: Fuchs Mchy. & Supply Co., 1102 Farnam Street.

*NEW JERSEY, ENGLEWOOD: Bucyrus-Erie Company, 214-216 South Dean Street. Phone 3-6727.

NEW MEXICO, ALBUQUERQUE: R. L. Harrison Co., Inc., 209 N. 4th Street.

*NEW YORK, NEW YORK: Bucyrus-Erie Company, 30 Rockefeller Plaza, Suite 5050. Phone Columbus 5-4395.
ALBANY: Contractors Sales Co., Inc., P. O. Box 949.
BUFFALO: Dow & Co., Court & Wilkinson Sts.
MINEOLA: H. O. Penn Machy. Co.
NEW YORK: H. O. Penn Mchy. Co., Inc., 140th St. and East River.
POUGHKEEPSIE: H. O. Penn Machy. Co.
*SYRACUSE: Bucyrus-Erie Company, 303 Draper Ave. Phone 6-1078.

NORTH CAROLINA, GREENSBORO: E. F. Craven Company.

OHIO, CINCINNATI: Bode-Finn Co., 1654 Central Avenue.
CLEVELAND: W. T. Walsh Equipment Co., 3088 W. 106th St.
COLUMBUS: H. S. Robertson, Walhalla Rd. Phone Jefferson 3242.
ZANESVILLE: Southern Ohio Equip. Co., 941-3 W. Main St.

OKLAHOMA, TULSA: Leland Equip. Co., 515 W. Archer St.

OREGON, PORTLAND: Clyde Equipment Co., 17th & Thurman Streets. Phone Broadway 5581.

*PENNSYLVANIA, PHILADELPHIA: Bucyrus-Erie Company, 821 Commercial Trust Bldg. Phone Rittenhouse 4281.
PHILADELPHIA: Furnival-Rimmer Co., Lancaster Ave. at 54th St. Phones: Trinity 5200 and West 1617.
BRADFORD: Beckwith Machy. Co., 361 Congress St.
HARRISBURG: Beckwith Machinery Co., 635 N. Cameron St. Phone 4-4064.
KINGSTON: Beckwith Machinery Co., 249 Market St.
*PITTSBURGH: Bucyrus-Erie Co., 1502 Clark Bldg. Phone Atlantic 4815.
PITTSBURGH: Beckwith Machinery Co., 6550 Hamilton Ave. Phone Montrose 4300.

TENNESSEE, KNOXVILLE: Brooks Equipment & Mfg. Co., 408-10 Davenport Rd.
MEMPHIS: Road Builders Equipment Co., Third and Calhoun Sts.

TEXAS, DALLAS: E. B. Chambers, 1806 Tower Petroleum Bldg. Phone 2-2943.
ABILENE: R. B. George Machinery Co.
DALLAS: R. B. George Machinery Co., 1135 S. Lamar St.
EL PASO: Tri-State Equipment Co., 500 E. Overland Ave.
HOUSTON: Gulf Tractor & Equip. Co., 3100 Polk Ave.
PECOS: Tri-State Equipment Co.
SAN ANTONIO: Wm. K. Holt Machy. Co., West Harding Rd.
TYLER: R. B. George Machinery Co.

UTAH, SALT LAKE CITY: The Lang Co., 267 N. First St.

VERMONT, BARRE: Reynolds & Son, Inc.

VIRGINIA, RICHMOND: Virginia Tractor Co., Inc., 1623 W. Main St.

WASHINGTON, SEATTLE: Clyde Equipment Co., 3410 First Ave., South.
*SEATTLE: Bucyrus-Erie Co., 3408 First Ave., So. Phone Main 6424.
SEATTLE (for Alaska): Northern Commercial Co., 419 Colman Bldg.
SPOKANE: Construction Equipment Co., 1118 Ide Ave.

WEST VIRGINIA, CLARKSBURG: General Equip. Co., Inc., 414 N. Fourth St.
HUNTINGTON: Chas. S. Porter Supply Co., 424 Fourth Ave.

WISCONSIN, MILWAUKEE: W. L. Hartley, 2446 N. 62nd St., Wauwatosa, Wis.

Canada

BRITISH COLUMBIA, VANCOUVER: Finning Tractor and Equip. Co.

MANITOBA, WINNIPEG: Kipp-Kelly, Ltd., 68 Higgins Ave.

NEWFOUNDLAND, ST. JOHN'S: Newfoundland Tractor & Equip. Co., Ltd.

ONTARIO, TORONTO: F. H. Hopkins & Co., Ltd., Commerce & Transportation Building.

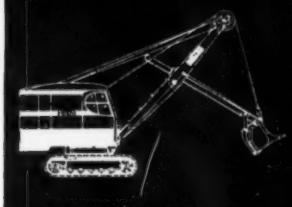
QUEBEC, MONTREAL: F. H. Hopkins & Co., Ltd., 340 Canada Cement Bldg., Phillips Square. Phone Plateau 1136.

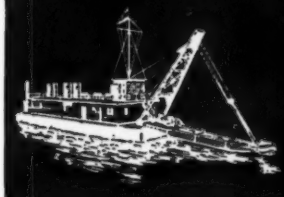
For Bucyrus-Erie Tractor Equipment — Bulldozers, Bullgraders, Hydraulic and Cable-Controlled Scrapers, Rippers, Tamping Rollers and Power Control Units See Your International Industrial Power Dealer

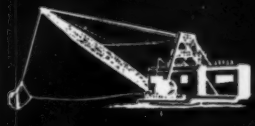
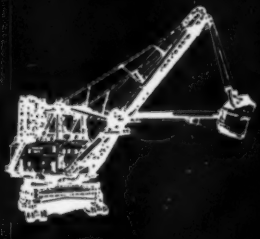
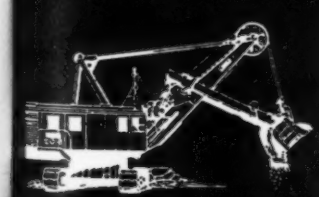
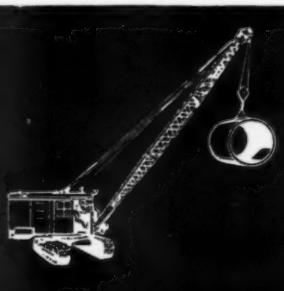
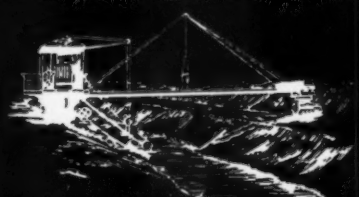
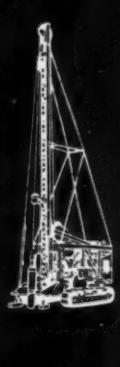
You can choose a modern Bucyrus-Erie and be sure of getting performance exactly suited to your needs. In 60 years Bucyrus-Erie has built over 30,000 machines for the excavating, drilling and material-handling field. With sales and service representation in all principal countries of the world, Bucyrus-Erie has a breadth of experience that is added assurance of the performance you want.

Bucyrus-Erie

GENERAL OFFICES: SOUTH MILWAUKEE WISCONSIN U. S. A.





NOT in the *Contract*

A sweet young thing grabbed a taxi the other day and said to the driver, "To the maternity hospital and never mind rushing. I only work there."

They say frequent drinking of water will prevent stiffness in the joints. The trouble is most of the joints don't serve water.

A census enumerator approached a lounging Negro dandy. He asked and learned the man's name, age, place of residence; then inquired, "What's your business?"

The answer came superciliously: "I owns a hand laundry, I does."

"Where is it located?"

"Dar she comes now!"

A rude and vulgar man is one who stares at a girl's figure when she's doing her best to display it.

Guest in Hotel: Manager, please send me up a full length mirror."

Maitre d'Hotel: "Why, there is a half length mirror in every room."

Guest: "That's just the trouble. Twice already, I've gone down to the dining room without my trousers."

The only difference between a cutie and an old maid is that the cutie goes out with the Johnnies and an old maid sits home with the willies.

Any girl can be gay,
In a classy coupe;
In a taxi they all can be jolly;
But the girl worth while
Is the girl who can smile
When you're bringing her home on the trolley.

When a girl finds she is not the only pebble on the beach, she becomes a little boulder.

"Sorry Miss, but we just can't seem to find your swimming suit!"

The Sultan Depends on Sam

An old Southern colonel was making a trip through Turkey and one day hired a guide to take him on a personally conducted tour of the Sultan's harem. While wandering around through the halls he suddenly recognized a burly black negro attendant as a former hand on his Southern plantation.

"Well, Sam," exclaimed the surprised colonel, "what on earth are you doing away over here?"

"Well, suh, boss," replied the grinning negro, "Ah'll tell you. Ah has de best job in de worl'. Every day ah sits head in front o' dish yeah do' way. Ah has a bowl o' watah in mah hand an' when dat long line o' beautiful gals wat belongs to de Sultan passes by, ah dips mah fingahs in de watah and trows it on 'em. When ah comes across one wat sizzles—ah is all done fo' de day!"

"Are you a college man?"

"No, a horse stepped on my hat."

Protect the birds. The dove brings peace and the stork brings tax exemptions.

I'm not under the alcofluence of incohol, but thinkle peep I am."

"I'm not half as thunk as you drink, but fool so feelish I don't know who is me."

Proud Mother: "Yes, he is a year old now, and he has been walking since he was eight months old."

Bored Visitor: "Really? He must be awfully tired."

"What is more beautiful than a pretty girl to behold?"

"Such grammar! You mean to be held."

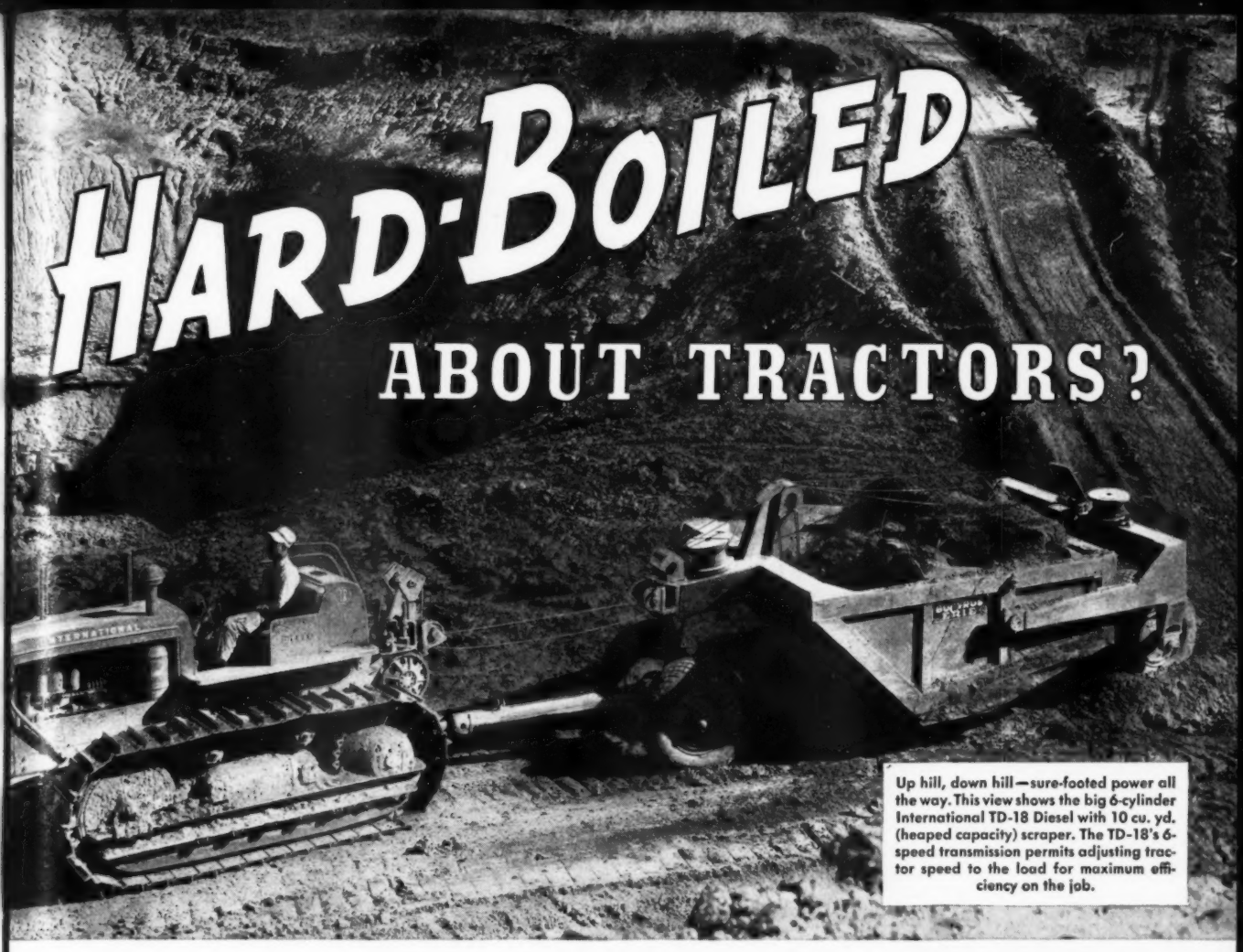
The nurse entered the professor's room and said softly: "It's a boy, sir."

The professor looked up. "Well, what does he want?"

Many of us feel that we could move mountains if somebody else would get the hills out of the way.

And then there was the girl who was so lazy she wouldn't even exercise discretion.

HARD-BOILED ABOUT TRACTORS?



Up hill, down hill—sure-footed power all the way. This view shows the big 6-cylinder International TD-18 Diesel with 10 cu. yd. (heaped capacity) scraper. The TD-18's 6-speed transmission permits adjusting tractor speed to the load for maximum efficiency on the job.

Choose INTERNATIONAL DIESELS!

IF YOU'RE HARD-BOILED about tractor operation, International Diesel TracTracTors are your logical choice. Here are four husky crawlers that take the toughest dirt moving jobs in stride . . . built from the ground up to weather the stresses and strains of heavy construction work. And through it all they keep maintenance and upkeep costs low.

Get the benefit of these TracTracTor features: easy-starting *full* Diesel engines; replaceable cylinder sleeves; Tocco-hardened crankshafts; full-pressure engine lubrication; fast, easy gear-shifting; wide speed range; positive track alignment; comfortable seat and convenient controls; individual unit accessibility; well located mounting pads for attaching balanced allied equipment; and many others.

Turn your tough jobs over to International TracTracTors. See the nearby International Industrial Power dealer or Company-owned branch for details.

Ask for a demonstration.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago, Illinois

† "Works fine," says the operator of this TD-6 Diesel, owned by A. J. Diana, Massilon, Ohio. Shown here grading dirt to make new lawn.

5 NEW INTERNATIONAL INDUSTRIAL WHEEL TRACTORS—two with Diesel engines, three with carburetor-type engines. Ask for demonstration.

INTERNATIONAL Industrial Power

Notes from the manufacturers

Worthington Pump and Machinery Corporation, Harrison, New Jersey, recently added Addison C. Armstrong to its Holyoke, Massachusetts works, as manager of the ordnance division. He will be directly in charge of the production of ordnance equipment at that plant. Mr. Armstrong was formerly affiliated with the Trucson Steel Company as a departmental manager. Previous to that he was associated with the Bartlett-Hayward Company and the Campbell Metal Window Corporation, both of Baltimore, Maryland.

The Lincoln Electric Company, Cleveland, Ohio, announces the appointment of Stewart J. Hieronymus as sales engineer with its San Francisco office. Prior to his appointment, Mr. Hieronymus was associated with Cutler Hammer, Inc. for 12 years.

The Hobart Brothers Company, Troy, Ohio, have appointed H. F. Schotters to supervise distribution of Hobart Arc Welders in northern Indiana and western Michigan, with headquarters at Koontz-Wagner Electric Company, South Bend, Indiana. Local distributors appointed to date include C. H. Antrim, Grand Rapids, Michigan; Hoosier Oxygen Service, Fort Wayne, Indiana; and Bingrods, Incorporated, Kalamazoo, Michigan.

Timken Roller Bearing Company, Canton, Ohio, recently transferred F. H. Lindus, formerly Los Angeles branch manager in charge of service-sales division of that company, to the home office at Canton where he is engaged in general sales promotion work. L. J. Halderman, Chicago branch manager of the service-sales division replaces Mr. Lindus while Jack Gelomb, Detroit branch manager of the same division, fills the Chicago vacancy. Joe Jesseph has taken Mr. Gelomb's place.

Charleston Tractor & Equipment Corporation, recently opened their new sales and service building on Kanawha Boulevard in the City of Charleston, West Virginia. In operation since 1934, this company serves the entire state of West Virginia and part of Maryland. Although tractors and their allied equipment are an important line of this firm, they also

handle a great variety of other material handling machines. The new building has a large showroom, sales room for meetings and social gatherings and a large stock room which is kept completely supplied with parts at all times.

Gifford-Hill & Company, Inc., Dallas, Texas, has elected J. Rutledge Hill as president to succeed Porter W. Gifford recently deceased. Mr. Hill was a co-founder of this organization which was established in 1926.

The B. F. Goodrich Company, Akron, Ohio, announces several changes in their sales staff. A. W. Doran has been assigned to special duties in connection with railroad and governmental sales. B. E. Silver, sales representative of the mechanical division in Indiana is transferred to government sales in Washington, D. C. and W. E. Nees appointed to his post, with headquarters in Indianapolis. Ralph Barcus of the Akron district staff succeeds Mr. Nees in the West Virginia territory, with headquarters in Charleston.

"HERE'S HOW..." To Get Better Service from the Wire Rope You Use—

Assuming that you have bought and have had delivered to you the size, grade and construction of wire rope suitable for your work and equipment, the actual service you obtain from that rope . . . regardless of what the rope is capable of doing . . . will depend largely upon the following:

(1) *The condition of the equipment on which the rope is to work, at time of installation.*

(2) *How the rope is handled from the time it is received unti it is installed.*

And here are some "Dos" and "Don'ts that should prove valuable.

Right *Wrong*

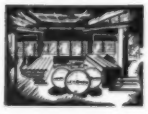
• 1 •

Reels and coils of wire rope should not be dropped from car or truck when being unloaded.

If iron bars are used to move reel, prying should be done under the reel flange and not against the rope.

If rope is not put into service when received, see that it is stored in a place protected from weather and free from acid fumes.

Use care when uncoiling or unreeling, so that the rope will not loop and form a kink.



• 2 •

Before a new rope is installed, make a thorough check-up of the equipment on which it is to work, to make sure

— that sheave grooves are of correct size and design.
— that sheave grooves are free from corrugations.
— that drum, sheaves and idlers are in line and properly lubricated so they will rotate freely.
— that there is no excessive fleet angle.

Unless you give your wire rope a fair chance, it will not give you the full service of which it is actually capable. In order to help all wire rope users obtain maximum efficiency from their wire rope, we publish a booklet "Practical Information on the Use and Care of Wire Rope," which covers many other conditions that deserve consideration. We would be glad to send a complimentary copy to any one interested.

A. LESCHEN & SONS ROPE CO.
WIRE ROPE MAKERS — ESTABLISHED 1857
5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U. S. A.

NEW YORK • • • 90 West Street
CHICAGO • • 810 W. Washington Blvd.
DENVER • • • 1554 Wazee Street

SAN FRANCISCO • • • 520 Fourth Street
PORTLAND • • 914 N. W. 14th Avenue
SEATTLE • • 3410 First Avenue South

For your convenience in writing to A. Leschen & Sons Co., you will find a card bound in this issue.

POSITIONS WANTED

Positions wanted advertisements will be run under this heading for 5 cents per word, minimum charge $1.00. Advertisements for help wanted free of charge.

Address all box numbers c/o EXCAVATING ENGINEER . . . . . at South Milwaukee, Wisconsin

SUPT.-FOREMAN

With 20 years' experience of concrete work on all kinds of buildings, bridges, highway roads. Will go anywhere in United States. Best reference. Box 9165

EXPERIENCED OPERATOR

Excavator operator with fifteen years' experience on highway and sewer construction jobs desires steady work anywhere. Can do own repair work. References furnished. Age 32. Married. Now located in Missouri. Box 9159

BLAST HOLE DRILL OPERATOR

Blast hole drill operator, 10 years' experience on gas, diesel and electric, large and small machines. Can do own repair work. Middle age, single and willing to go anywhere in U. S. A. Excellent references. Box 9160

EXPERIENCED OPERATOR

Operator with 20 years' experience on steam, diesel and electric draglines and shovels. Prefers steady work in rock quarry, gravel pit or strip mine. Tools. Experienced on repairs. Married, sober, reliable. Best references. Box 9166

BLAST HOLE DRILL OPERATOR

Three years' steady employment on Loomis Clipper "44." Cyclone piston type 1200-G and Bucyrus-Armstrong 27-T and 42-T, gas and electric blast hole drills on Penna. anthracite coal field. Able to make repairs. Unmarried. Age 39. Now located in Pennsylvania; willing to go anywhere. Can furnish best of references. Wants steady job on any blast hole drill: preference Armstrong. Box 9161

New trade literature

Title: **"The Story of Superfinish"**

Subject: Only book in the world completely covering all phases of metal surfaces—their production measurements, metallurgy, and use. Highly technical subjects are discussed in non-technical terminology with many pictures (720) to illustrate the interesting material contained in this book. Of great value in any work where precision or lubrication are important.

Where to Get: Lynn Publishing Company, 5106 Buckingham Road, Detroit, Michigan. Price, $5.00.

Title: **"1940 Performance Data and Laboratory Report"**

Subject: Essential facts on four actual jobs followed by laboratory mix analyses made from job extraction tests. Fundamental principals and suggested specifications also included.

Where to Get: Barber-Green Company, Aurora, Illinois. Free upon request.

Title: **"Buckets For Coal and Coke"**

Subject: Described and illustrated in the booklet are both light and medium weight units; two line lever arm buckets for crawlers, truck and locomotive cranes, derricks and whirleys; special high speed coal tower buckets of the two-line type; and four rope buckets to operate on bridge and gantry type cranes. There are diagrammatic explanations of a number of technical features, including an analysis of cable life and a table on bucket capacities.

Where to Get: Blaw-Knox Company, Pittsburgh, Pennsylvania. Free upon request, ask for bulletin No. 1807.

Title: **"How To Teach A Job"**

Subject: Of considerable timeliness is this manual in which the author sets forth, from actual experience in industry, an organized plan for teaching new workers specific jobs, quickly. The four steps, preparation, demonstration, explanation, and application are dealt with in detail.

Where to Get: The National Foremen's Institute, Deep River, Connecticut. Price, $1.00 per copy.

Title: **"What Happens When Your Roads Break Up?"**

Subject: Discussed and illustrated quite thoroughly is the problem of bad roads. Armco perforated pipe plays a very important part in the correction of these faults and this booklet tends to show how. A picture story of Armco subdrainage is also included.

Where to Get: Armco Drainage Products Association, Middletown, Ohio. Free upon request.

Title: **"Parkway Cables"**

Subject: Story of the origin, development, and uses of both metallic and non-metallic cable. Specifications also included.

Where to Get: John A. Roebling's Sons Company, Trenton, New Jersey. Free upon request, ask for catalog J-862.

Title: **"Versatility"**

Subject: Using natural color photography to illustrate, this booklet thoroughly discusses the correct applications, advantages, and limitations of the Travel plant for low cost road

WRITER WANTED

For advertising department large Mid-Western manufacturer. Would like young married man, preferably graduate engineer, with several years field experience in excavating involving handling of machinery and men. Must be able to write clearly, concisely and logically. Photographic experience would help. Job offers regular hours and permanent location with occasional field trips. Write fully, stating qualifications, experience, salary required, references and enclose good snapshot. Box 9167 c/o Excavating Engineer

PROOF OF THE BUCKET *is in the* DREDGING

Dredging generally places abnormal wear on buckets in places not seriously affected by even the toughest above-surface digging.

But Owen designing minimizes such wear with "Alemite" lubricated, sealed underwater bearings and specially shaped counterweights which push the materials away from sheaves and cables.

The OWEN BUCKET *Co.*

6095 BREAKWATER AVE.
CLEVELAND, OHIO

BRANCHES: New York, Philadelphia, Chicago, Berkeley, Calif.

For your convenience in writing to The Owen Bucket Co., you will find a card bound in this issue.

mix, the Central plant for "intermediate" type mixes, and the Central plant with gradation control for high type mixes.

Where to Get: Barber-Greene Company, Aurora, Illinois. Free upon request, ask for bulletin 842.

Title: **"Facts You Should Know About Rex Speed Prime Pumps"**

Subject: Design and manufacture of these pumps is stressed along with valuable data on how to pick a pump for a specific job. The new pumps have been designated as 50th anniversary models in celebration of the company's 50th year in business.

Where to Get: Chain Belt Company, Milwaukee, Wisconsin. Free upon request, ask for bulletin 384.

Title: **"Power For Construction Jobs"**

Subject: A detailed account (32 pages) of "Caterpillar" products on road-building and industrial operations. The booklet contains many interesting domestic job shots and illustrates and discusses work in other lands.

Where to Get: Caterpillar Tractor Company, Peoria, Illinois. Free upon request, ask for form No. 6569.

Title: **"Cam and Roller Hoists"**

Subject: An illustrative analysis of the complete line of cam and roller hoists for installation on all sizes of trucks, trailers and 6-wheelers. Specifications also included.

Where to Get: Gar Wood Industries, Inc., Hoist Body Division, Detroit, Michigan. Free upon request, ask for bulletin No. 2.

Title: **"Standard or Special — Gatke Makes It!"**

Subject: Profusely illustrated with actual job pictures showing machines at work on which Gatke equipment is being used, this broadside describes the manufacturer's line of "2-way engineered" products.

Where to Get: Gatke Corporation, 228 North LaSalle Street, Chicago, Illinois. Free upon request.

BARGAINS IN USED EQUIPMENT

FOR SALE, RENTALS, BUSINESS OPPORTUNITIES, TRADES, ETC.

To the reader wishing to advertise used equipment in the "For Sale" Section: All advertising in this section is payable in advance. Enclose your check or money order with copy. Rate: 60c per line. Minimum charge $2.40. No discounts; no commissions. If no change in copy is desired, three continuous insertions are offered for the price of two. Read these instructions carefully. Each line contains 41 characters (34 characters if all capital letters are used). Count spaces and punctuation as one character each. Allow 10 characters for box number, if blind advertisement is desired. Count your own copy to save delay. Holding up your advertisement one month to secure approval of revised copy or an additional remittance may cost you real money in a lost sale. Be sure to enclose the correct amount of money with your order. Closing date—15th of preceding month. Example: January issue closes December 15th.

To the reader wishing to answer "For Sale" Section advertisements appearing on these pages: Be sure to address your inquiry to the advertiser by using the correct box number. Mail your letter in care of Excavating Engineer, South Milwaukee, Wisconsin. Write each advertiser a separate letter. Do not write us for name and address of advertiser. This information will not be given out. We have no information about the equipment advertised other than that shown in the advertisements themselves.

SMALL SHOVELS, CRANES AND DRAGLINES

Up to 2½ Cubic Yards

BUCYRUS-ERIE 10-B ¾-yard clamshell, dragline and pull-shovel. Used one year. Located Wisconsin. Box 2734

OSGOOD "CONQUEROR" Gas Combination 40' boom dragline and clamshell. Operating condition. LeRoi engine. Located Missouri. Box 2742

MARION MODEL 331 Diesel Dragline. 45' boom. 1 yd. YAUN Basket type drag bucket. Kohler light plant. Has only worked two years. A-1 condition. Located Louisiana. Box 2745

BUCYRUS-ERIE GA-2 High Lift 1 yd. Shovel. Waukesha WS engine. Single Shaft Cata. Operating condition. Located eastern Pennsylvania. Box 2566

LINK-BELT MODEL K-48 Gas Shovel. 1¾-yd. Esco dipper. Good operating condition. Located Montana. Box 2618

BUCYRUS-ERIE GA-2 Gas-Air high lift shovel. 24' boom. 18'4" dipper handle. 1¼ yd. dipper. Waukesha 6¼"x8" 4-cylinder engine. Electric starter. Quantity spare parts included. Excellent condition. Located Eastern Pennsylvania. Box 2559

KOEHRING MODEL 301 Gas Clamshell. 35' boom. Includes ½ cu. yd. clamshell bucket. Wisconsin engine. Had a general overhaul three months ago. Located Wisconsin. Box 2739

BUCYRUS-ERIE 10-B Gas Shovel-Twin Rope Crowd. Buda engine. Excellent condition. Located Georgia. Box 2735

KEYSTONE MODEL 4 — Gasoline dragshovel. Operating condition. Located western Pennsylvania. Box 2526

MARION Model 381 Shovel. Waukesha-Hesselman 6-cylinder 7"x7" engine. 182 H.P. at 1000 R.P.M. 25'6" boom—17'6" dipper handle—2¼-yard dipper. Substantially field reconditioned. Located Chicago. Box 2725

ONE BUCYRUS-ERIE 43-B diesel powered shovel. In first class operating condition in every way. Located Texas. Box 2754

LIMA MODEL 801 Waukesha-Hesselman 70' boom dragline including 2½ yard AX drag bucket. Engine just factory rebuilt with guarantee. First class mechanical and operating condition. Located Illinois. Box 2746

BUCYRUS-ERIE 10-B Gas Shovel. Good operating condition. Located State of Washington. Box 2736

LORAIN MODEL 60 1 yd. Gas Shovel. Waukesha engine. Machine generally overhauled few months past. Operating condition. Located Minnesota. Box 2743

BUCYRUS-ERIE GA-2 Gas-Air 65' boom Clamshell. Waukesha engine. A-1 condition. Located Illinois. Box 2744

BUCYRUS-ERIE GA-2 Gas-Air 1 yd. Shovel. Very good operating condition. Located North Carolina. Box 2708

INDUSTRIAL TYPE I, 30-40 ton steam locomotive crane. Did not operate 1932-39 inclusive, since overhauled. Now excellent condition, can demonstrate. Located Northern Minnesota. Box 2753

NORTHWEST 6—1½ yd. Shovel. Twin City Oil Engine. Field reconditioned. Excellent shape. Located San Francisco. Box 2717

LIMA 1001 Electric Dragline. 60' boom. 2½ yard Heavy Duty Esco drag bucket. 1000' power cable. Motor 200 HP Slip ring type 3 phase 60 cycle 440 volt. Excellent condition. Located California. Box 2747

BUCYRUS-ERIE 50-B Electric Shovel. 30' boom, 17' dipper handle, 2-cu. yd. dipper. 3 motor suitable for power supply 3 phase 25 cycle 440 volt. Excellent condition. Located Southern Wisconsin. Box 2750

KOEHRING MODEL 401 Combination Shovel, dragline and clamshell. Located Missouri. Box 2741

BUCYRUS-ERIE 20-B ¾ yard 2 motor electric shovel. Suitable for power supply of 3 phase 60 cycle 440 volt. Now operating. Located Tennessee. Box 2738

OSGOOD COMMANDER II Combination ¾-yd. Shovel—Cable Crowd and 40' boom dragline including ¾-yd. drag bucket. Hercules engine. Good operating condition. Located California. Box 2690

Dragline-Crane For Rent

READY TO WORK. K44 Link-Belt crawler dragline-crane. 55' boom, 1¾-yd. drag bucket. Crane capacity 25 tons at 12'. Light Plant. Located Iowa. Box 2729

BUCYRUS-ERIE 10-B Gas Dragline and Crane—28' boom, ¾ yd. AX drag bucket. Three ton hook block. Independent boom hoist. Buda engine. Used only six months. Reasonable price. Located Missouri. Box 2737

NORTHWEST No. 8 Dragline. 150 H.P. Cummins Diesel engine. 60' boom. 2-cu. yd. Hendrix bucket. Located Kansas City. Box 2723

BUCYRUS-ERIE 30-B Diesel 50' boom Dragline. 1¼ yd. Page drag bucket. Good operating condition. Located Illinois. Box 2540

NORTHWEST No. 3 Combination shovel and dragline. Gas power. Including 30-ton practically new trailer. Located Missouri. Box 2740

BUCYRUS-ERIE 1030 Gas Combination Shovel. Clamshell, and Drag Shovel with three dippers. Electric starter. Wisconsin engine. Recently thoroughly rebuilt. Located Massachusetts. Box 2653

NORTHWEST Model 80-D 2½-yard Shovel. Twin City oil engine. Excellent condition. Located Chicago. Box 2728

LORAIN MODEL 87 2-cu. yd. Shovel. Caterpillar Diesel 17,000 engine. Kohler light plant. Excellent condition. Located near Pittsburgh, Pennsylvania. Box 2689

LORAIN 75-B Combination 1½ yd. Shovel and Dragline. Waukesha gasoline engine—just overhauled. Located Eastern Pennsylvania. Box 2686

INDUSTRIAL-BROWNHOIST. 40' boom Clamshell including 1¼-yd. Owen bucket. Buda Gas engine. Ready for a season of hard work. Located Central Illinois. Box 2751

FOR SALE — REAL BARGAIN

OSGOOD—1-YD. gas crane and dragline. New 1927, now working. Cat. mounted, 40' boom, 6-cyl. Le Roi engine, self starter, enclosed cab. Price $2,100.00, Chicago. Box 2731